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[Founded in 1849 as the "Journal of Gas Lighting."]

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EDITORIAL NOTES.

Steaming Vertical Retort Charges—The Fuel Research Board's Investigation.

A FURTHER study of the report of the Fuel Research Board on "Steaming in Vertical Retorts" is most instructive in the light of the discussion that took place on Sir George Beilby's paper at the meeting of the Institution of Gas Engineers. In the first place, one thing that strikes us is that, while there is a certain amount of kudos applying to the selection of a particular contractor's plant for the carrying-out of investigations of this kind, such an investigation, with a detailed public report upon the working and the results obtained under the varied conditions of testing with various coals, may not be altogether an advantage to the contractor and his particular type of plant. But against this may be set the fact that not a single competing plant has been subjected to the same rigorous examination. We say this merely in justice to the particular form that has been adopted, and is being used for testing purposes at the Research Station. It is not, however, the particular plant that is under investigation, but the system of continuous carbonization, of which the plant is typical, and which was adopted (as the report says) for one especial reason, and that is because Glover-West retorts provide "means by which "the temperature from top to bottom can be controlled by "a series of horizontal combustion chambers." This point was emphasized by Dr. C. H. Lander, when submitting Sir George Beilby's paper at the meeting. He said that the decision as to the selection of plant "was prompted by the "ease with which the temperature in these retorts could "be varied and regulated from top to bottom, by means "of the independent combustion chambers." It is quite obvious that in working-scale research such as that at the Fuel Research Station, flexibility in temperature manipulation is an important desideratum. This is the sole reason given for the choice that turned the balance in favour of the Glover-West system. At the same time, bearing upon this question of heating, there had to be some modification of the design of the setting (though the essential features of the system were not interfered with), in view of the fact that, as much of the proposed experimental work involved the preparation of really accurate thermal balance-sheets, the general methods of firing and temperature regulation which had already been adopted at the station had to be applied to the vertical retort-setting. Another thing that strikes us is that the whole report is a notable testimony to the simplicity of the plant and the continuous process; inasmuch as not one of the experimenters had had previous practical experience of such plants under ordinary gas-works conditions.

There are various references in the report to the prior work of independent gas engineers with steaming vertical charges—more particularly to that of Mr. J. E. Blundell, when at Macclesfield. When considering the results at the Fuel Research Station, it is interesting to bear in mind that the early results referred to were the precursors of all the remarkable working records that have followed with continuous vertical retorts, and that these early results were obtained with the pre-war design of the Glover-West setting. These authentic results have indisputably borne-out the assertion that steaming does not affect materially the throughput of the retorts, and that there are exceedingly valuable compensations, as the report of the Fuel Research Board confirms. This question of throughput has close relationship with the point as to the selection of coal for continuous vertical retorts. In the front part of the report, under the cross-heading of "Experimental Work at "the Fuel Research Station," there is an allusion to differences of type of coal. "Differences of type," it is said, "which have relatively little significance when carbonization "is carried out in horizontal retorts, become of the greatest "importance when it is carried out in continuous vertical "retorts." It is added: "This is true when no steam is "used, but much more is it the case when steaming is intro-"duced." There are experienced engineers who describe this as a fallacy; but it is a "fallacy" that gains more and more credence from the cumulative effect of reiteration. The point has been made quite a controversial one, but only by differences in practice. Successful practice with the very coals that are said to give trouble elsewhere is the undeniable proof that there need not be the difficulty of which one hears, particularly down South. There are coals which give difficulty in horizontal retorts, but which, with the necessary temperature regulation, can be effectively dealt with in continuous vertical retorts. Neither is any real difficulty found in steaming particular varieties of coal, and obtaining good results therefrom, though naturally coal of a non-caking character is more readily steamed than coal of a caking type, unless suitable regulation is made in dealing with it. The very first series of experiments at the Fuel Research Station were with Consett [Durham] coal; and the report states that "when the combustion chambers had "reached a satisfactory temperature," no trouble was experienced in passing this coal through the retorts at any time during its use at the station. This is an important statement when considered in relation to the earlier one as to differences in type of coal being of the greatest importance when treating coal in continuous verticals.

Mr. Thomas Hardie, now the President of the Institution, in the discussion on the report at the meeting, was rather struck by this apparent contradiction; but he could not say that he was surprised by it, because he has had considerable experience with carbonizing Durham coal in continuous verticals. "My experience has been," he said emphatically, "that any kind of coal can be carbonized satisfactorily in "continuous retorts, provided that the temperature and "throughput of the retorts are kept in proper proportion." With positive results before us, it cannot be agreed that the benefits to be gained by steaming Durham coals are small and the difficulties great, compared with those resulting from other varieties of coal. There is not only Mr. Hardie's assertion, but there is the experience recently published from Blyth [see "JOURNAL," Sept. 7, p. 551] as to the results of carbonizing second-class Durham coal—an average yield of 21,380 c.ft. of 425 B.Th.U. gas being obtained, or nearly 91 therms. At the same time, a suitably designed retort should give better results than those obtained at the Fuel Research Station with caking coal; and we learn from the publication of the makers, reviewed in our issue of last week [p. 253], that retorts with this object in view are in course of construction at Leigh, Lancashire, so that results should soon be available. A point that also rather surprised Mr. Hardie has reference to the maintenance of a constant throughput of coal in the Fuel Board's tests, and to the fact that they were able to maintain the quantity of coal they had done as throughput while steaming to such a large extent. He gave reasons for his surprise [see p. 208 last week], and added that, if the Board are proposing to carry these experiments farther, it would be well for them to vary the throughput and maintain the steam, and see what the results are then because in general practice it has been found necessary, in order to realize the best results with steaming, to reduce the throughput of the retorts. However,

in several parts of the report, the Board emphasize the importance of the gains in therms by steaming in vertical retorts; and this confirms previous practical experience as to the economic advantages of the process.

Bearing upon the point as to the importance of varying throughput and temperature, attention is arrested by certain difficulties mentioned in the description of the carbonizing tests "G" and "H," as well as later by a reference to the different quantities of steam very materially affecting the speed at which it is necessary to work the coke-extractor in order to maintain a desired throughput of (say) 2½ tons per day. In test "H," there is allusion to considerable difficulty being experienced in keeping the charges travelling, and in the sticking both at the bottom and the top of the retorts—this with Mitchell Main coal. This must be due to the unsuitable temperature conditions before-mentioned, as generally there is an entire absence of this trouble when retorts are steamed. The same remarks apply to the reported hanging-up of the charges of Consett coal. In short, the conditions of the tests were no doubt responsible for all the difficulties mentioned, which difficulties are invalidated by the conclusion at a later stage of the report as to the necessity to reduce throughput, in order to obtain the maximum results with steaming. In practice, the throughput and the temperature conditions are readily varied to suit both the quality of the coal being dealt with and the yield of the gas to be obtained per ton. Steaming, too, is not limited by the sticking of the charge; and this must be overcome by suitable adjustments of the heats. If this limitation referred to was a general experience, other means would be adopted to overcome it; but there would certainly not be any such retrograde step as resorting to intermittent working in order to deal with it.

There are two or three further points as to heat, with which we must deal briefly. In treating of the question of the temperature of the combustion chambers and of the flues, the report mentions temperatures at the chimney of 850° to 950° C. These are not usual with the type of settings such as those at the Research Station. Much lower temperatures are obtained when working with three circulating chambers at the top, which is the standard practice. The efficiency of a chimney is increased by the reduction of the temperature down to about 350° C. Again, with regard to the "heat equivalent" given in the report, the figure is a very valuable one; and the enunciation of the principle is a distinct advance in carbonizing practice. But the actual figures realized under the conditions of the test do not, in our opinion, represent what would be found in a setting forming a portion of a standard Glover-West installation. As against 12·4 therms heat equivalent at the Fuel Research Station, a heat equivalent of 8·4 therms was found at Uddingston. However, in any case, the figure should be carefully ascertained in practice on a larger scale before any sweeping conclusions are drawn from it.

There are a number of other points in the report with which we cannot deal on the present occasion—this article having already reached considerable length. But there is a point that must not be missed. It says: "An increased "yield of gas from the coal is obtained without the necessity "for any additional heat from the combustion chambers. "In fact it is necessary actually to reduce the external heat "applied until the quantity of steam added becomes more "than the incandescent coke can deal with without the "assistance of extra heat from the combustion chambers." This statement should be particularly noted. There is, in fact, sufficient residual heat in the coke to account for the requirements of steaming at least up to 24,000 c.ft. per ton. This is a good point at which for the present to leave questions that are so largely occupying the minds of men who will be responsible for the choice of new carbonizing plant in the immediate future.

The Therm and Local Authorities and Consumers.

Gas-supply local authorities are not bestirring themselves as are gas companies in making application under section 1 of the Gas Regulation Act, 1920. The fact was referred to by Mr. James Cubie, in his Presidential Address to the Scottish Junior Gas Association (Western District), as published last week. We have looked over our records of applications for Orders under the section in question; and it is surprising how the local authorities show as a mere sprinkling among the companies who have made application. The only reason for this, in our opinion, is that the question of realizing the powers under the Act were more urgent on financial grounds in the case of the companies than in that of the local authorities. So far as we know, there is no objection, either conscientious or material, on the part of local authorities to the change from the volumetric to the heat-unit basis of charging. Their undertakings are members of the National Gas Council; and they, with the companies on that body, were represented in the case that the Council put up when prosecuting and supporting the measure in Parliament.

In time, the local authorities will come along, not because of the compulsory powers that are vested in the Board of Trade and will enable the Department to bring into line all halting gas undertakings after two years from the passing of the Act (it received the Royal Assent on Aug. 4 last year), but because the Act has larger intentions than altering the basis of charge. This point is all too frequently overlooked. Parliament henceforth is not going to stand in the way of gas-manufacturing progress by placing upon it stifling standards, but is going to allow each undertaking, having regard to its circumstances, to declare the calorific value it can most economically supply, with conditional liberty to change as the circumstances alter. Charging upon the therm basis will bring into line all undertakings with their varied declared calorific powers, by putting them on to the standard basis of charging per 100,000 B.Th.U. Charging on the therm basis is really incidental to the liberty that calorific declaration gives; and it is this liberty that will cause local authorities voluntarily to come under the Act. They are not by any means unmindful of the advantages the Act confers upon them as gas manufacturers.

Mr. Cubie does not appear to be altogether enamoured of the therm basis of charging. He inclines to the view that figures being introduced that are extraneous to the meter, will probably produce discontent and dissatisfaction among the general body of consumers. We are of the contrary opinion. Meters have always been suspect; and the character of "bad gas" has been, whether deserved or not, something traditional, from the time when it was of 16-candle power and even more. Discontent is a habit so far as gas is concerned; the increasing use and popularity of gas are the satisfactory answers to the discontent. The fact that the thermal multiplier will be guaranteed by official tests made independently of the gas suppliers will, we believe, have excellent effect in promoting confidence among the consumers.

Economical Production at Dunfermline.

Among the men who are grateful that they had the material assistance of vertical retorts during the past year is Mr. James Campbell, the Engineer and Manager of the Dunfermline Gas-Works. He was very fortunate in being able to bring into use his new Woodall-Duckham plant on Aug. 23 last year. Had he not been able to do this, his annual report (from which some particulars were given on p. 250 last week) would have borne a very different complexion, seeing that the financial year ended on May 15, and so covers the period of the coal strike in the autumn last year, and a moiety of the time of the big coal strike this year, but not the worse half. To Dunfermline the vertical plant proved an economy and a safeguard, as similar plant has this last year in many other places. The consumers, too, have had the satisfaction of buying gas at a price only 1s. 5d. above the 2s. 3d. charged eleven years ago, or an increase of, in the circumstances, merely 63 p.ct., though the price of coal last year was 38s. 5d., compared with 8s. 5d. eleven years since. Mr. Campbell has good reason in reporting that his new plant has given every satisfaction, to which he adds that the results obtained are in excess of the contractors' guarantee. Nevertheless, the period during which the plant has been in operation has not given it a fair chance of showing its full economic ability as compared with the old plant—seeing that, during the time of the autumn coal strike, the retorts had to deal with coal from stock which proved of poor quality; and, during the long strike this year, it has been called upon to carbonize not only coal from stock, but American and such other sorts as the general scramble for coal enabled the Engineer to secure. This disadvantage notwithstanding, the quantity of gas made during the year increased by 7,780,000 c.ft.; while the coal carbonized decreased by 3358 tons, or by 4082 tons if the make of gas had continued at the level of the previous year's production. The average yield of gas, despite the indifferent coal, in the nine months the verticals

were at work during the financial year was 14,237 c.ft. per ton. The decrease in carbonizing wages for the year was £2619. If we take the net value of the 3358 tons of coal saved at 10s. 6d. per ton (the larger figure of 4082 tons might be fairly taken), this would amount to £1763; and, adding the reduction of £2619 in carbonizing wages, there is a saving of £4382. Dunfermline has every reason to be pleased with its new economy-producing carbonizing plant, which has enabled gas through a most difficult year to be sold at such a reasonable figure. In the current year, the advantages of the plant will apply to the whole twelve months, although it includes the resistances to the highest efficiency inserted by the second and worse half of the coal strike.

An Inconclusive Report from Glasgow.

The deputation who went out from Glasgow to see housing schemes supplied for the various domestic requirements with gas or electricity, have returned with a most inconclusive report; and, without any disrespect, we feel there is ample justification in the document itself for saying that, for all the guidance it affords, the deputation might just as well have stayed at home. We are, however, pleased they have been, as the report offers an opportunity for dealing with certain matters that have struck them, as well as certain matters that have not struck them or are evaded in the report, which is obviously a compromise as between the two contestants for domestic favour—the claims for electricity being largely vague; those for gas being of a material order, and demonstrating popularity throughout the length and breadth of the land. Two things that must have impressed the deputation (though unacknowledged in the report) are the number of authorities who have plumped for gas for the housing schemes, and that, where electricity has got an innings, it is in the main due to the possession by the local authorities of the electricity supply. Even the Barking Council, though controlling electricity, have for their housing scheme favoured gas. Need one go far to ascertain the causes of preference and decision? It means that where the rivals have competed squarely and commercially, with no extraneous consideration putting weight into the balance, gas has been winning all along the line. The facts of economy to those installing and to those consuming the commodity, combined with over-all usefulness, have been too great in favour of gas and against electricity where the terms had a competitive basis, as they must have where companies are in competition. There are cases where electricity has got in for lighting, and gas for other purposes. What has been the result? That though the one installation for gas would have sufficed, the initial expenditure for mains and services has been about doubled to give the dual service. This is sheer waste of money, simply to get a modicum of the business for the electricity concern.

The deputation appear to have confined their inspections of electric-coal schemes (they evidently failed to discover an all-electric one) to Billingham and Eltham. Now the Billingham scheme is one carried out by the Newcastle-upon-Tyne Electric Supply Company for their employees, who are favoured in the matter of the price for current. They are charged a fixed sum of £5 per annum, *plus* ¼d. per unit for all current consumed. It is estimated (it has not been ascertained by actual experience over any considerable time) that the average consumption will be 3500 units, which at ¼d. per unit will make £3 13s., or, with the £5, £8 13s. per annum. To this the cost of the coal fire used in the living room, which is fitted with a boiler, has to be added. The total cost of the electricity on this basis only averages 0·59d. per unit. Where is there a local authority or a company who can profitably supply electricity for domestic purposes at anything like this figure for all purposes, or part of them? The report tells the readers, with bountiful simplicity, that "the tenants are well satisfied with the results, and aver "that cooking in the electric-oven is more dependable than "cooking in the gas-stove; and the regulation of heat is "more easily accomplished." Was the electric-oven the only use the deputation went out to explore? What of room heating, and water heating, and boiling on hot-plates? The oven is a small use in the household, compared with the other service for which heat is required. And did the deputation really expect to hear anything else from the employees of the Newcastle-upon-Tyne Electric Supply Company? If they did, then they are not well acquainted with human nature. Moreover, if the employees of an electric supply company cannot manage an electric-oven, then we do not know who can. Not long ago the "Electrician," in referring to the Billingham scheme, said: "As each house is "occupied by families of technical experience, we shall look "forward in due course to hearing a good deal about what "can be done with electric cooking *when it is placed in proper "hands*." There is something in that for the deputation to ponder over; and they might in conjunction with it consider the point that housing schemes are not exclusively for electricity employees with technical experience.

Passing on to Eltham, where an electric scheme is also found (coal being used in the living room), the deputation were treated to some amount of assumption which they pass on in the report. It was stated there that "if" the average consumption of electricity for the year in each house is 1500 units, the Council could supply it profitably; but it is calculated that the average consumption of each tenant averages 21 units per week, which is only 1092 units a year, and not 1500. The charge here is 2½d. per unit [Is this for lighting as well?], which comes to 4s. 4½d. per week, or £11 7s. 6d. per annum, *plus* coal. A point not explained in the report is if the Billingham electricity employees require 3500 units per annum, why the non-electricity-employee consumers at Eltham can manage with 1092 units! It is very wrong of the non-technical users of Eltham to think they can work more economically with electricity than the technical ones of Billingham. However, if unfortunately, the consumption of the Eltham consumers runs up to 3500 units, at 2½d., this would mean a claim on their pockets to the amount of £36 9s. 2d.! And then we imagine there would be rude things said about the members of the Council who led them into such a mess. Another matter as to installation. The ten points per house at Eltham cost £1 9s. 6d. each. The deputation should see what this figure comprises. It is apparently for internal wiring only; and the cost for this is £14 15s. The cooker costs £14 15s. The report is either vague or altogether ignores the cost of the other electric appliances. However, there we have £29 10s. accounted for. The deputation report that on the Becontree estate the gas-mains and all fittings cost £22 per house, for lighting, heating, and cooking. There are 3000 houses there. The difference between £22 and £29 10s. is £7 10s., which, multiplied by 3000, means £22,500!

The report also deals with the Woodford, Becontree, and Barking gas schemes. In the Barking scheme, it is stated, no coal or electricity is used. In the Woodford and Becontree schemes, we believe coal-fires are employed in the living rooms; but in these cases hot water is provided in bulk by gas at a very reasonable figure. Why? Because for all heating purposes the potential heat supplied by gas is so much cheaper than that by electricity. The deputation evidently know very little of relative thermal values. This raises the question (which we have already drawn to the surface by referring to the wide difference between the computed annual average consumptions at Billingham and Eltham) as to why the schemes at Woodford, Becontree, and Barking—not insignificant ones the deputation must confess—have been handed over exclusively to gas. There is a reason, and a material reason, which applies not only to first cost, but to the ultimate actual service rendered to the consumer. These schemes, and what we have yet to say, substantially weaken the remarks in the report that "it was "*fairly* manifest to us that, in point of utility, convenience, "cleanliness, freedom from fumes, as well as chances of "accidents, the tenants who were occupying the all-electric "houses [electric-coal] were unanimous that electricity was "to be preferred, and *probably* many of them would be "prepared to pay something extra for the advantages "electricity confers." The "fairly" and the "probably" betoken indefiniteness; the "freedom from fumes" and the "chances of accidents" an ignorance of facts which the journeyings of the deputation have not removed.

What genuine advantages do electricity confer that gas does not give? From the consumers' standpoint, economy must be the main appealing advantage. The deputation appears to have been unable to test what they were told by applying to it a little technical knowledge on the subject of heating. Their knowledge of this matter is obviously very limited, because they were "informed" (and apparently accepted the information without question) that there are "3880 B.Th.U." in each unit of electric current. A unit of electricity will develop 3420 B.Th.U.; and it is a physical impossibility to get it to render more heat than that. We see that, in one of the gas schemes examined, the price of gas, including the charge for fittings, is 5s. 6d. per 1000 c.ft. At

480 B.Th.U. per cubic foot, the 1000 c.ft. possess potential thermal energy to the amount of 480,000 B.Th.U. The 5s. 6d. would at 2½d. per unit purchase 26·4 units of electricity, and would supply 90,288 B.Th.U. as potential energy, as against 480,000 B.Th.U. for gas. In using this gas for heating, 75 p.ct. efficiency can be obtained, which means that 360,000 B.Th.U. is given off as useful heat out of the 480,000 B.Th.U. If the 90,288 B.Th.U. of the 26·4 units of electricity is used at 90 p.ct. efficiency, the consumer will get only 81,180 B.Th.U. as useful heat. If in boiling water, or in other liquid-heating operations, only 50 p.ct. efficiency is obtained with gas, this means that useful work will be rendered to the consumer to the extent of 240,000 B.Th.U. The 90,288 B.Th.U. of the 26·4 units of electricity, at 40 p.ct. efficiency for the same purposes, would mean 36,080 B.Th.U. in useful work. Our examination of the report leaves us impressed by only one thing, and that is its utter inconclusiveness; and this partly through an effort to steer a middle course.

First Calorific Power Standards.

At the luncheon given by the South Metropolitan Gas Company to the members of the Institution of Gas Engineers and friends, Mr. H. E. Jones referred to what the South Suburban and the Wandsworth Gas Companies did in 1912 in obtaining calorific standards. Lest some men in the industry who are not fully conversant with the history of the subject should run away with the idea that these were the first calorific standards applied to the gas-supply industry, and for the sake of historical accuracy, may we recall that, by agreement with the London County Council, provision was made in the Gas Light and Coke Company's Act, 1909, for a standard of calorific power. At that date no other calorific standard had been prescribed except as regards power gas, and that was in the South Staffordshire Mond Gas Act of 1901, in which a minimum heating value of 125 B.Th.U. was prescribed.

Scientific Investigation of Coal.

The scientific investigation of coal offers a vast and fascinating field, particularly to those who are engaged in the work of getting the utmost value out of the raw material by the process of carbonization. Last Saturday Prof. J. W. Cobb addressed the members of the Yorkshire Junior Gas Association on the subject; giving them what he described as a "very general" account of the methods which can be employed for investigating the physical characteristics of coal. The publication of the address in other columns will claim the consideration of a large number of readers, who will be as interested as were the members of the Association present at its delivery.

Dr. Parker on Steaming in Verticals.

At the last stages of preparation for this issue of the "JOURNAL," Dr. Parker's written contribution to the discussion on Sir George Beilby's Institution paper on "Steaming in Vertical Retorts" came to hand. It is published in later columns.

Inerts and the Three Years' Probation.

When dealing with the report of the Departmental Committee on Incombustibles in Gas, we laid particular emphasis on the fact that the Committee in effect recommended three years' probation in order to secure evidence under the heat-unit basis of charging. The Committee were not struck as to nitrogen having any notable harmful effects on efficiency, but they were less persuaded regarding carbon dioxide. We also pointed out that it might be taken as pretty certain that the interested local authorities and the railway companies would be watchful during the three years. We learn that the Public Control Committee of the London County Council have decided, in view of the possibility of a further inquiry being held after a period of three years, to continue the practice that has hitherto obtained of analyzing samples of gas supplied to London and collecting evidence on the subject.

Gas Coal Position.

The past week saw more collieries closing-down and an extension of unemployment, though in the mid-zone of the coal areas it is reported that a better state of things now exists in respect of unemployment. As to the demand for gas coal, the conditions appear to oscillate from week to week. In Northumberland and Durham there was a poor demand last week; and some of the collieries producing the class of coal in which we are interested are reported to be either closing-down or working short time. Prices at the pithead in these districts are several shillings below what they were before the strike. Yorkshire appears to be getting a good share of the business now going with gas undertakings; but in other directions the demand is below the level usual at this season of the year. The cold weather may make a difference in the outlook.

Artistic Gas Appliances.

Recognition of, and encouragement to, the makers of gas appliances are given in an article by "Electrocynic" in the "Electrician." At one time, he holds, electricity boasted all the virtues of beauty and adaptability, and gas the solid qualities of utility and economy. Gas apparatus then was not often good to look upon. Now, in the matter of artistic production, it seems to the writer in our contemporary that gas has at the moment all the advantage. He has been studying the apparatus in gas showroom windows; and there he finds some really beautiful apparatus, which in design and workmanship is infinitely superior to the ill-made and rococo exhibits of the makers of electrical appliances. He sees gas cookers, fires, and fittings of the most delightful appearance—worthily made, cleverly designed, and without any superfluous ornament, or imitative effect. They appeal to one's sense of beauty and fitness. In the electrical showrooms he sees a repulsive riot of bad design, absurd imitation, and rotten workmanship. He grinds as an absurdity the electric log-fire under his heel, and ridicules electric cookers that look like hay-boxes, and are priced like "Eagle" ranges. It is not that there has been retrogression in electrical design, but the writer has to admit that the makers of gas appliances have moved a long way ahead. This is good and fair recognition; and there are no signs that gas appliance makers are resting on their oars. Particular attention is being paid just now to efficiency.

Dirty Coal.

Coal owners in the Derbyshire and Nottinghamshire districts have made a movement for the restoration of the practice of filling coal by the use of forks instead of shovels. The demand on the part of the owners is on economic grounds and for the benefit of consumers, who are tired of paying the price of coal for the large percentage of useless stuff that now reaches them under the description of coal. The miners have benefited by the use of the shovel; the whole country has suffered since the abandonment of the fork. In the districts named, notices have been given to the men; and they expire on Oct. 26. It is also observed that the management of the Lewis Merthyr Colliery Company, of Rhondda, through dirty coal and inadequate output, recently gave their employees and officials notice to terminate all contracts; but it was agreed to suspend notices for a week, if the men would improve their work. The men agreed. It is a matter over which the owners must make a firm stand.

Therm Value of Water-Gas Carburation.

An article by "A Gas Engineer" appears in "The Times Engineering Supplement." Its mission is to give information to those who are ignorant of the factors which cause the price of gas to be high with a falling market for coal. Our readers do not need that information. Later the writer deals with gas-making economies, in which part of the article he points out that perhaps the most remarkable feature of the present situation is the possibility afforded by the collapse in oil prices, of returning to carburetted water gas in lieu of the popular blue water gas. Enriching oil can now be obtained for 5d. per gallon; and there are, he thinks, distinct possibilities of the price falling still lower. We hope he is right, though how long the price would remain lower is too speculative a matter to hazard any opinion upon. But at the present price of oil, and having in view the market conditions for secondary products, it is a question for serious consideration as to whether it would not be more profitable to curtail straight coal gas production with horizontal working, and to augment, where the necessary plant is available, the manufacture of water gas with oil. The only additional expense that would

be incurred by changing from blue water gas to carburetted water gas is that of the enriching oil. The case for this change is put this way: A gallon of enriching oil costs 5d., and yields approximately 135,000 B.Th.U.—20,000 B.Th.U. being recovered as condensable products forming the tar, and 115,000 B.Th.U. in gaseous form. Thus it is possible to obtain at least a therm from a gallon of oil. Straight coal gas now costs, at a minimum, 6d per therm into the holder, so that a cheaper therm is produced from oil. Where the net cost of straight coal gas per therm into the holder exceeds the cost per gallon of oil, then it will be profitable to use oil, quite apart from the subsidiary advantages that arise from the use of a proportion of oil to counteract the corrosive influences of certain ingredients of some brands of present-day gas, and to assist in the correction of naphthalene troubles.

Carbonic Acid and Plants.

Some ten years or so ago information was published as to the effect of products of combustion of gas on plant life. It was then seen how the carbonic acid (which is food to plants) from gas-burners has really a beneficial effect upon plants, though naturally they do not want too dry an atmosphere nor too high a temperature. Experiments which have been recently made in Germany indicate that, by conducting to the leaves of plants air having a higher carbonic acid content (up to 1 p.ct.) than the normal amount, has a beneficial effect, just as growth is stimulated by supplying their roots with the required fertilizers. The experiments have been conducted by the Dortmund Union—a section of the Deutsch-Luxemburgische Bergwerksund Hütten—covering plants placed in closed hothouses as well as in the open field. Two houses were equipped with plants uniformly; but in one a perforated pipe was run to carry in the gas. In the latter, the crop was richer—the tomato crop, for instance, being 2·75 times, and the pumpkin crop 1·7 times, larger than in the other house. Two similar squares in a field were also tried—one being bordered with perforated concrete pipes, which continuously discharged gas so that the plants were swept by it day and night regardless of the direction of the wind. A comparison of the results showed that the spinach crop of the "gassed" field was 2·5 times, the potato and the lupine crop 2·8 times, and the barley crop double that of the ungassed field. In both tests the faster growth of leaves, stalks, and roots was noticeable in the "gassed" house and field square. It is pointed out that vast quantities of carbonic acid gas are available in the form of exhaust gases obtained from blast-furnace gas-engines. Incomplete combustion, resulting in the presence of a large percentage of carbon monoxide in the exhaust gas, does not appear to have any material influence.

Suggestions on Storing Coal.

With full appreciation of the fact that any or all of the following precautions may prove impracticable or unreasonably expensive under certain conditions, they are offered by Mr. C. E. Paige, the Manager of the Worcester (Mass.) Gas Light Company, in a paper submitted to the tenth annual congress of the National Safety Council, as advisable for safety in storing bituminous coal: Do not pile over 12 ft. deep, nor so that any point in the interior of a pile will be over 10 ft. from an air-cooled surface. If possible, store only screened lump coal. Keep out dust as much as practicable; and to this end reduce handling to a minimum. Pile so that lump and fine are distributed as evenly as possible—not, as is often done, allowing lumps to run down from the peak and form air passages at the bottom of the pile. Re-handle and screen after two months, if practicable. Do not store near external sources of heat, even though the heat transmitted be moderate. Allow six weeks' "seasoning" after mining and before storing coal. Avoid alternate wetting and drying. Avoid admitting air to the interior of the pile through interstices around foreign objects, such as timbers or irregular brickwork, or through porous bottoms, such as coarse cinders. Do not try to ventilate by pipes, or more harm than good may often be done.

Wales and Monmouthshire District Institution.—At the meeting of the Institution to-morrow, in Chepstow, Mr. H. D. Madden, of Cardiff, will add some notes to the paper read by him (but not discussed) at the meeting in June last year; and Mr. E. Linsley will contribute a paper descriptive of the "Simplex" carburetted water-gas plant. After luncheon on the invitation of the Chairman and Directors of the Chepstow Gas Company, there will be an inspection of the gas-works, under the direction of Mr. James Robb (Engineer and Manager); and then an afternoon drive will be followed by tea.

PERSONAL.

Mr. A. R. THOMAS, who has during the past nine years been Works Manager of the Malta station of the Malta and Mediterranean Gas Company, Ltd., has resigned owing to ill-health. About four months ago, Mr. Thomas was operated upon by Sir Hugh Rigby at the London Hospital; but we regret to hear that the operation was not altogether successful.

OBITUARY.

Mr. STEPHEN CARPENTER, who died on Tuesday morning of last week, enjoyed the esteem, not only of many personal friends and acquaintances, but also of the business community of his town; and by the Sutton Gas Company, of which he had been Manager for 46 years, his loss will be deeply felt. As an official of the Company, he was exceedingly popular equally with the Directors, the staff, and the workmen; and his genial and hearty character, combined with his technical skill, had more than a little to do with the smooth working of the affairs of the Company. For some considerable time past his health had been gradually failing; and on the Friday before his death he was seized with a paralytic stroke, from which he never recovered. Born in 1851, he went to Sutton in 1875, from the Gas Light and Coke Company's works at Bow Common, where he was under his father. When he joined the Sutton Company, the gas production was somewhere in the neighbourhood of 30 million c.ft. per annum; and from these small beginnings, he saw it grow to some 380 million c.ft. From the first, he threw himself whole-heartedly into the task of getting the best results; and many improvements which have been effected were due to his suggestions. Evidence of his tact and fair dealing with the men is provided in the fact that not once during his connection with the Company was there any labour trouble. He was an exceedingly kind-hearted, liberal, and upright man. As a public man, Mr. Carpenter served on many bodies. He was a member of the Sutton Urban District Council for some years, occupying the position of Chairman in 1907-8. He leaves a widow and three sons and five daughters. His eldest son is with the Wandsworth Gas Company.

ELECTRICITY SUPPLY MEMORANDA.

THE Electricity Commissioners continue to grant heavy sums of money for the extension of municipal electricity stations, and apparently without any inquiry—at any rate, any public inquiry.

Without Public Inquiry.

When local authorities had to apply to the Local Government Board, or their successors the Ministry of Health, for sanction to loans for electricity or other works, the Board or Ministry held inquiries into the applications, at which interested ratepayers or other opponents possessing *locus standi* could be heard, and have their representations considered; and some of the heaviest ratepayers are the gas undertakings, with which electricity concerns are in competition. If gas supply is the work of private enterprise, and expenditure on the municipal electricity concern is extravagant and unremunerative, or if the management is bad and prodigal, then the gas company is one of the principal ratepayers to be called upon to bear the resulting financial deficiency, which is not only grotesque but unjust. We see, for example, that at Redditch "provision has to be made to meet an estimated further loss of £6750, equalling a 2s. 6d. rate, on the electricity undertaking in the ensuing half year." That is a pretty prospect for the ratepayers, including the rate-paying Gas Company; and a point of interest is that this has to be met in the ensuing half year. The Gas Company cannot fall back upon the rates in this way, but instead has to make a profit for itself, and something over to pay for the shortages of its competitor! Never was anything more absurd tolerated in a country devoted to industry and business. But the point as to the absence, now that the Electricity Commissioners have become enthroned, of the old form of inquiry (which at all events rendered some form of protection to ratepayers) is a matter of considerable importance. There is the Hastings Electricity Department, for instance, with a nasty record for making deficits, and imposing levies upon the ratepayers for the maintenance of the concern, which has in hand a big scheme for the extension of the existing station, estimated to cost some £55,000. So far as we can gather, the Electricity Commissioners have already granted the Corporation permission to borrow £42,000 without public inquiry, which might have been expected would have been regarded as essential having in view the past history of the undertaking. The change is not a good one; and it is altogether in opposition to the recommendations of the Select Committee who reported as to local expenditure early this year. [See "JOURNAL" for Jan. 19, pp. 152, 169, and April 27, p. 194].

Not a Brilliant Outlook.

Having taken Hastings as an example of this new procedure in granting loans without public inquiry, it may be of interest to examine the last-issued accounts of the Department—that is, for the year ending March 31.

Progress is shown, and an improved financial position, though here was a deficit of £247 on the year's working. The accounts were closed prior to the long coal strike, which must have cost the Department directly and indirectly a considerable sum, and will affect the figures for 1922. During the year there was an increase in the amount of current sold to public lamps, as well as in that sold to private consumers. The latter advanced by the record number of 672; but many of them are probably small, and of questionable financial advantage. The total cost, excluding standing charges, averaged 4·96d., or nearly 5d. per unit; and, as has been the practice for many years past, a considerable amount of current was sold under this average figure. The average price received per unit, which includes 50 p.ct. increase on pre-war charges, was 6·686d.—a considerable improvement on the year before. The Department have authority to charge up to 1s. per unit; but the highest price charged for peak-load or chiefly lighting consumers was 9¾d. Much of the financial improvement is due to the greater sale of current to this class of consumer at the higher figure. Some basic charges have been increased since the end of the last financial year; and there is a possibility, apart from strike losses, of reduced costs for coal, &c. There is, however, some doubt as to the financial result of the present year if direct rate aid is to be avoided. In the previous year ending March 31, 1920, there was a surplus of £3552 due to paying-off capital charges. It is therefore rather surprising in the year under review to observe that the sinking-fund charges have increased; and annual interest charges, owing to the higher rates paid, have also increased. Thus the anticipation of reduced revenue charges due to less capital charges has not been realized; and large sums of money are now being raised so that there will be heavier charges to be met in the future than in the immediate past. According to the accounts, the accumulated deficiency on the undertaking to date as raised by rate is £35,232—nothing ever having been repaid to the rates for losses made good from time to time. The surplus of £3552 made in 1920 has been placed to profit and loss appropriation account, and the deficiency for last year debited against it—thus leaving a balance of £3305, which, although not profit having regard to rate aid, would be something to meet a deficiency in the current year.

Hiring-Out Electric Appliances.

We do not know whether it is the return of the Gas Light and Coke Company to the hiring-out business that has energized the Electrical Development Association to try to make electricity undertakings exert themselves a bit to do the best with their very bad job in the matter of heating with expensive appliances and heat units. Anyway, the Director of the Association has put his pen to paper on the subject. He points out that, although all electricity supply undertakings now possess hiring-out powers, few there are who are taking advantage of them. It is urged that it is essential to provide hiring facilities for the more expensive pieces of apparatus; and supply engineers are therefore asked to consider the possibility of starting the hire of domestic apparatus with a minimum of preliminaries and elaboration—in other words, to get the work going gently. The advisory note proceeds: "There is little fear that the inauguration of hiring systems will result in a flood of orders, and in embarrassment to the supply undertakings." That is a noble confession; and we go on: "Although hiring is essential, much spade work has to be done, and the suggestion is rather that undertakings which have not done any hiring at all should obtain from their authorities a grant or permission to spend a limited sum in the course of six months or a year on the purchase of apparatus for hiring-out. If the matter were approached in this way, it might be easy to obtain the necessary permission or grant, whereas proposals for an extensive hiring system might be objected to." Glasgow recently indulged a little speculation on a hundred cookers. Maidstone spent £1200 on the purchase of apparatus for hiring-out; and a further £1000 was authorized. The money so far spent appears to have provided 100 electric-fires, 150 electric-irons, and 15 cookers, which are reported to be all out on hire. This does not suggest a great rush for the appliances. According to the "Electrical Times" report, if an outlay of £500 more is permitted, "it would be all that would be required." We do not quite know what this means. Is it the estimated saturation point? We should not be surprised.

An Electrical Believer in Gas.

Mr. Bernard Sankey, of Johannesburg, is an electrical engineer who takes a broader and wiser outlook regarding the applications of electricity than do many of his contemporaries in the same profession in the home country. Though here, owing to the prevailing conditions of high prices for appliances and per unit of potential thermal energy, there has been a slowing-down in the effort to secure consumers for heating and cooking purposes, which would land the officers of the electrical undertakings into a mass of dissatisfaction and probably permanent injury to the business. Mr. Sankey was speaking at a meeting of the South African Institution of Electrical Engineers; and he boldly asserted that, if electrical undertakings attempted to take on cooking and water-heating, they were going to land themselves in a lot of trouble. If they only had a sparse connection of cookers, things might be all right; but when they began to get cookers connected-up on an extensive scale, then it was necessary to go chasing-round with a voltmeter trying to find out where the volts had gone to, and accompanied with a thermometer to ascertain what was wrong with the ovens. His advice to central power stations regarding cooking was that much better could be done with gas. In his opinion, it would pay large municipalities in South Africa to run a gas undertaking in conjunction with their electricity stations, and take the water heating and cooking on to gas, and work the two concerns together. In his view, there is any amount of money in gas making; and it is as good a proposition as electricity—if not better. There is much sense in what Mr. Sankey says, and little of the same quality in the comments electrically generated that we have seen upon what he had to say. Even the fact that Johannesburg may be a district of a very scattered character, and therefore requiring a large expenditure in distributing cables, makes no difference to the general principle of whether or not it is a good thing to connect-up to such systems, at relatively low prices for current, electrical appliances which are only intermittently used. For example, in this country there has been very little need to use electric or any other heaters since the end of last winter; and all this time the generating plant which would be necessary to meet any considerable demand would have been standing idle, as well as the heating appliances. Of course, in the case of gas the mere fact of ample storage makes all the difference to this branch of business.

Small Undertakings and Combination.

In the previous paragraph reference is made to the view of a South African electrical engineer regarding the combination of gas and electricity undertakings. He was only looking at the matter from one point of view, and not that from which we have frequently discussed the same question. Our point of consideration has been in regard to the working economy that can be derived from the union of the gas and electricity concerns in one area; and it has been shown that there is more in this than originally met the eyes of our electrical friends. In a recent issue of the "Electrician," Mr. A. H. Dykes contributed an article on "Some Steps to a Reconstructed Industry." We must confess that, after reading the article, the points made by Mr. Dykes, which are all somewhat commonplace in the discussions of the times, do not supply any particularly practical scheme for assisting in any reconstruction whatever, so far as the electricity industry goes. In one part, he points to the financial stringency that exists at the present time from various causes; and then he goes on to suggest that—as the war was won by mobilizing the whole resources of the Empire, by putting into the fight the best brains, the best organization, and the best labour of which Great Britain was capable—the only chance of winning-back the prosperity of the country is by adopting similar methods, with the addition of thrift and economy, which were not conspicuous during the war. These are interesting, if platitudinal, points; but as we read-on, there is disappointment in hoping to ascertain how he would provide the capital for reconstructing the electrical industry, and what suggestions he has to make for brain power organization, and for producing thrift and economy, in order to win-back, or gain greater, prosperity for the electrical industry. We note that Mr. Dykes was not dealing solely with the electrical industry, but with industry generally. Concerning finance, he makes the not over-brilliant suggestion that something might be done by the large manufacturing firms and their financial friends to assist their customers in the present crisis. In what way can they assist them? Large manufacturing firms cannot themselves obtain money without paying a high rate of interest for it; and their payments for contracts executed are very belated owing to the same causes applying to their customers as to themselves. We see no reason why substantial electricity undertakings should not be able to get money on the same or even better terms than the manufacturers; but apparently that is not what Mr. Dykes desires. Evidently he would like the manufacturing firms to take upon themselves the responsibility of raising money, and then lend it more cheaply to the smaller electricity supply companies than they themselves could raise it at. In other words, he wants the manufacturers to change their coats from business men to philanthropists. He points out the difficulties that the small electricity supply companies have had during the war and since, in regard to not being allowed to charge prices sufficiently high to bring them in profit. Thus they have been utterly unable to raise money for necessary extensions of mains. These smaller companies are, of course, in an exceptionally bad position in regard to raising money; but the argument still holds good that the manufacturing firms and their financial friends cannot possibly advance them money for capital purposes at a rate of interest which would leave them no profit compared with the interest they could derive by the investment of the money in their own businesses.

The Better Way.

However, the aim and object of Mr. Dykes appears to be to enable the devising of a scheme whereby small supply companies could get additional mains on easy terms. We would suggest that a much better method of improving the position of these small electricity concerns (which appear to be in a very weak and anæmic condition at the present time) would be by linking-up in the small towns the gas and electricity supplies in one concern. At the present time, in many of the small urban areas, gas and electricity suppliers are simply doing their best to cut each other's throats, and neither concern can make a proper

living, though as a rule gas, with its varied custom, can make a better living than the electricity concern. Together, they could achieve a greater prosperity, and indeed might become quite affluent through the cutting-down of the running charges, the availability of cheap fuel, and the co-ordination of labour. By such union the same material-handling plant would suffice. The same boilers that are required at the gas-works, with coke as a fuel, would provide the necessary steam power, or gas produced by the gas-works could be used for the direct driving of gas-engines for electricity generation. There is considerable economy in these things. But Mr. Dykes has missed them all, and seems totally unable to do anything better than suggest that manufacturing firms should do something which they cannot do without loss of money on the capital sunk in the way he proposes. Perhaps Mr. Dykes will be interested in reading an article in our issue for Oct. 5 [p. 24], under the heading of "To Co-Ordinate the Economical Provision of Light, Heat, and Power."

SIXTY YEARS AGO.

[From the "Journal" for October, 1861.]

Mr. Flintoff Again.—The attempts made by Mr. Flintoff to cross the Border have been of no avail; for the many letters he has written from Edinburgh to the Newcastle papers have failed to excite a desire to hear his voice on the banks of the Tyne. He has, however, been extending his scene of action northward, in Scotland; the fair town of Perth and "Bonnie Dundee" having been favoured with his presence. There, as elsewhere, he has repeated the oft-told tale of the exorbitant charges of the gas companies, of processes of gas making by which gas can be produced for little or nothing, and of his own achievements in saving thousands upon thousands of pounds to the consumers of gas in every town he has visited. When recounting to his audience at Perth the great victories he had gained over gas companies, he is reported to have said "they had surrendered, and that apparently to the greatest cheat who ever walked on the face of this or any other country." His audience cheered the announcement; and we will not gainsay it. Having given that character of himself, it could not be expected that he would be very complimentary to us. The "Journal of Gas Lighting" was well abused; and he alluded to our statements of his adventures at Sheffield as being remote from truth. There are, however, some stubborn facts which remain steadfast amid storms of contradiction; and, though it may please Mr. Flintoff to vaunt of the benefits derived from his new Gas Company at Sheffield, the fact is undeniable that the supply of gas at 3s. per 1000 c.ft., from May 1, 1850, to June 30, 1854, and at 4s. from the latter date to June 30, 1855, entailed a loss on his Company of £1596 3s. 4d., as certified under the hand of the Chairman of the Company. It seems that Mr. Flintoff changed his tactics at Dundee, and, instead of advocating the formation of an independent consumers' company, he recommended the purchase of the existing works by the Commissioners, after first adopting the dishonest expedient of getting-up a competition to reduce the value of the shares—which, he asserts, might thus be reduced to one-fifth their present estimate.

Gas Supply of Paris.—The gas sold by the Paris Gas Company in the year 1860 has reached the enormous quantity of 2484 million c.ft., while the gas-rental has increased to £678,474; and the dividends have risen from 8 p.ct., which was the rate paid after the fusion of the six companies, in 1856, to 14 p.ct. in 1860. A sinking fund has also been formed for the redemption of the share capital in fifty years. After 1871, the municipal authorities divide with the Company, in equal proportions, all excess of profit beyond 10 p.ct.; but, until this period arrives, the whole of the profits are divisible among the shareholders.

Books Received.

Acknowledgment has to be made of the receipt of the following recently issued books: "The Popular Chemical Dictionary," a second edition of a useful book by Mr. C. T. Kingzett, F.I.C., F.C.S., which has been called for in less than two years after the appearance of the first edition—Messrs. Baillière, Tindall, and Cox, 8, Henrietta Street, Covent Garden (price 21s. net). "An Oil Trade Calculator," compiled by Dr. T. Howard Butler, M.Sc., F.I.C., for easy conversion of weights to gallons at different specific gravities—Messrs. Scott, Greenwood, & Son, 8, Broadway, Ludgate, E.C. (price 10s. 6d. net). "The Riddle of the Rhine," by Major Victor Lefebure, O.B.E. (Mil.), F.C.S., &c., with an introduction by Field-Marshal Sir Henry Wilson, Bart. This book deals with chemical strategy in peace and war; with the campaign fostered by the great Rhine factories, and the pressing problems which they represent. The subject of chemical warfare is an exceedingly important one, bearing in mind the fact that it is likely more and more to dominate the military future of the nations—Messrs. W. Collins, Sons, & Co., Ltd., 48, Pall Mall, S.W. (price 10s. 6d. net). "Income-Tax Made Easy for Everyone," by T. Howard Coath, F.A.A., a second edition of a simple guide for the "man in the street" on matters which he usually finds complicated—Messrs. Simpkin, Marshall, Hamilton, Kent, & Co., Ltd., 4, Stationers' Hall Court, E.C. (price 2s. net).

GAS ACTS FOR 1921.

[First Article.]

To-day we commence the survey of the Special Acts dealing partly or wholly with gas affairs that have been passed in the present session of Parliament. In doing this, as in recent years, we shall not deal generally with the measures, but only call attention to any variations that have been made in them since the Bills were originally noticed by us. The review of the Bills was commenced in our issue for Jan. 5 last; and readers who wish to refer to the notices then made will find they are contained in the four numbers issued in that month.

The first Act to be noticed is that of the Batley Corporation. As was pointed out when the Bill was dealt with on Jan. 5, the bulk of the gas clauses are of quite normal form in present-day gas legislation. There is nothing therefore to which to call special attention in connection with them. The Bill originally asked for £100,000 of capital for the general purposes of the gas undertaking, with a redemption period of forty years. This has been altered to £120,000, with a redemption period of thirty years. [*Parliamentary Agents: Messrs. Dyson, Bell, & Co.*]

The Burnley Corporation in their Act conferring general powers obtained the authorization to purchase, or take on lease, offices, showrooms, and other buildings, for the purposes of their gas undertaking. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, & Co.*]

The Act of the Cardiff Gas Company is, of course, one of the features of the legislative work of the session, so far as gas supply is concerned. We gave a very full account of the provisions of the measure in our first issue this year. The principal part of the Act deals with the heat-unit basis of charging. The first change that is found is in regard to the notice that has to be given for the declaration of calorific power after the passing of the Act. In the Bill, it was provided that this notice should be given within six months. This period has been shortened to three months. Those clauses to which are appended marginal notes "The Declared Calorific Value," and the "Basic Price of Gas," are for the purposes of the Gas Regulation Act to be deemed respectively to be an Order of the Board of Trade under that Act; and the provisions of that Act so far as applicable to, and not inconsistent with, the provisions of this Special Act are to apply to the Company and the undertaking accordingly. Originally, the Company asked that the provisions of the Gas Regulation Act as to composition, pressure, testing, forfeitures, &c., should be postponed until a date to be fixed by the Board of Trade; and it was suggested that the minimum pressure might be varied for different parts of the area of supply. But the Company have, we see, been brought into line with the decision of the Board of Trade in respect of the matter of pressure—that is to say, the Gas Regulation Act will still apply in respect of pressure, with this addition that, if the declared calorific value is less than 350 B.Th.U., the minimum permissible pressure at which gas may be supplied (provided the calorific value is not below 300 B.Th.U.) shall be 2½ in.; and if the declared calorific value falls below 300 B.Th.U., the minimum permissible pressure is to be such (not being less than 3 in.) as may be prescribed by the Gas Referees. As to the basic prices of gas, these, too, have been altered. We need not mention the figures originally asked for. But the prices are now as follows: Within the boundaries of the City and the Urban District of Penarth, 1s. 2·2d. per therm; within the rural district, except the parish of Pentyrch, 1s. 2·8d. per therm; within the remainder of the limits of supply, including the parish of Pentyrch, 1s. 4·6d. per therm. Regarding the rents and charges for fittings, section 35 of the Company's Act of 1906 is now to have effect as if the remuneration or rents and charges mentioned in the proviso to subsection 1 of that section were 2·4d. per therm. In the Bill the Company asked that the basic rate of dividend on the ordinary capital issued before the passing of the Act should be 6 p.ct., and on ordinary capital issued after the passing of the Act 8 p.ct. These percentages stand in the Act respectively at 5 p.ct. and 7 p.ct. Passing to the question of the participation in benefits resulting from good working, the Company, as intimated when noticing the Bill, are following the plan of the South Metropolitan Gas Company in respect of the division of profits in lieu of the old sliding-scale. But in the Bill the Company asked that the amount which should be set aside (when the selling price or prices of gas were below the basic figures) for division among the holders of ordinary stock and the employee co-partners, should be equal to one-half of the total by which the consumers had benefited in the year or half year, as the case may be, by way of a reduction in the price of gas. The "one-half" has now been altered to one-third, which brings the scheme into harmony with that approved by Parliament for the South Metropolitan Gas Company. With regard to additional capital, the promoters originally sought power to issue £300,000. This has now been reduced £100,000. Borrowing powers have been allowed at the rate of one-half the amount of the capital authorized by the Act, and of the capital authorized by any previous Act still remaining to be issued. The debenture, redeemable preference or debenture stock, the reserve fund, and the special purposes fund clauses are all continued in the Act. The limits of supply have been extended; and the Company have been granted powers to use for manufacturing purposes certain defined

lands. There are a number of miscellaneous powers, including one providing for superannuation and other allowances. [*Parliamentary Agents: Messrs. R. W. Cooper & Sons.*]

The COLNE CORPORATION Bill contained provisions referring to the heat-unit basis. But this part of the measure has been eliminated. [*Parliamentary Agents: Messrs. Baker & Son.*]

The Act of the HARROGATE GAS COMPANY also deals with the heat-unit basis; and originally, as was seen when reviewing the Bill, the principles of the precedent set by the South Metropolitan Company's Act were followed in the scheme of this measure. Passing over the preamble of the Bill, we come to the part dealing with the consolidation of stocks; and in this there have been no changes from the original proposals. As to additional capital, the Company formerly desired authorization to raise £200,000 by the issue of further amounts of consolidated stock, and of new preference shares or stock. This sum is reduced in the Act to £120,000. In the Bill the borrowing powers sought were on the one-third scale; but sanction has been given to the borrowing of sums not exceeding in the whole one-half of the amount of the additional capital authorized by the Act and issued. Debenture stock provisions succeed; and later the Company are empowered to transfer from their net revenue account for the year ending Dec. 31, 1920, to the special purposes fund £3423 7s., being the aggregate which, pursuant to section 26 of the Act of 1909, the Company might have appropriated out of the revenue in years preceding that year as part of the expenditure on revenue account, and paid to the special purposes fund, but did not do so. Also from the same source the Company are authorized to transfer to the reserve fund £2298 10s., being the aggregate amount of divisible profits in years preceding the year named applicable to payment of dividends on the ordinary capital at the prescribed rates from time to time, or for setting apart and carrying to the credit of the existing reserve fund, but not applied in either of these ways. Coming to the heat-unit clauses, we see that, in respect of pressure, the proposals of the Company (as noticed when referring to the Bill) have been extended so as to incorporate the pressures noted in the Cardiff Act for gas of less than 350 B.Th.U., but not less than 300 B.Th.U., and for gas less than 300 B.Th.U. The testing of gas is to be under the prescription of the Gas Referees. The calorific power of the gas is to be declared within six months of the passing of the Act. In the Bill the proposed basic price of gas was 11·2d. per therm. In the Act, it is provided that the basic price shall be 1s. 0⅜d. Another change is that the Company may increase or reduce the price charged by them above or below the basic price; but they are not to charge for gas any higher price than 1s. 1⅝d. (which in the Act is referred to as the maximum price), and they are not in any one year to declare any larger dividend on the consolidated stock than at the rate of 10 p.ct. A discount at the rate of 10 p.ct. is to be made upon any payment for gas within fourteen days of the delivery of the account to the consumer. Succeeding is a provision that the amount to be carried from the net revenue account at the end of each year shall not exceed the amount required to pay one year's dividend on the preference stock and the consolidated stock. If it should exceed this amount for the year ending on Dec. 31 next, the excess is to be applied in the next year and the two following years (at the rate, as near as may be, of one-third of such excess in each of the years) in making or allowing rebates to the consumers of gas at a uniform rate per cent. from the amounts of their respective accounts. To this there is a proviso that, if the amount carried forward from the net revenue account for the first or second of the years (including any portion of the excess) shall be less than the prescribed amount, the obligation imposed to make or allow rebates in the second and third or the third (as the case may be) of the said years shall cease to have effect. In respect of any year during which the average price charged for gas is less than the basic price, there is to be applicable for the benefit of the employee co-partners out of any balance standing to the credit of the net revenue account for that year (to such an extent as the Directors may in their discretion determine) an amount not exceeding (*a*) a sum calculated at the rate of one-half of 1 p.ct. of the aggregate salaries and wages in that year of the employee co-partners for each one-fifth of a penny by which the price is less than the basic price; or (*b*) a sum equal to 6 p.ct. of the aggregate salaries and wages whichever of these sums shall be the less. It will be seen from this that there has been in the Act a departure from the plan inaugurated last year by the South Metropolitan Gas Company. Provision is made for the revision, upon representation to, and the satisfaction of, the Board of Trade, of the basic price or maximum price for the time being in force, at any time after the expiration of any or every period of five years. In regard to the reserve fund, this is not to exceed the aggregate of 10 p.ct. of the sum of £184,320, and 10 p.ct. of any sum or sums, including premiums, actually raised by the issue of additional capital. The maximum charges for hire of a prepayment meter and fittings and of a prepayment meter without fittings is to be at the rate of 2d. and 1d. respectively for each therm supplied, or in either case at the rate of 10 p.ct. on the cost of meter and fittings (if any), whichever shall be the higher. In the next part of the Act, provisions appear for the institution and regulation of a profit-sharing scheme. The proposal to amend the Company's obligations in regard to furnishing a supply of gas has been amended. When noticing the Bill originally, we quoted this section; and in view of the changes that have been made, it will be as well to reproduce the section as it stands in the Act.

Section 66 (Company to Supply Gas in Certain Events at Request of Owner or Occupier) of the Act of 1863, and Section 39 (Amending Section 66 of Act of 1863) of the Act of 1909 are hereby repealed; and in lieu thereof the following provisions shall have effect (that is to say):

(1) The Company shall, at the request in writing of the owner or occupier of any premises situate within fifty yards from any main of the Company, give and continue to give a supply of gas for such premises; and they shall provide and fix or lay a meter, and any main or extension of main, and any service-pipe that may be necessary for such purpose subject to the conditions following (that is to say): Every owner or occupier requiring a supply of gas shall serve a notice on the Company at their office, specifying the premises in respect of which such supply is required, and the day (not being an earlier day than a reasonable time after the date of the service of such notice) upon which such supply is required to commence, and shall, at the option of such owner or occupier (as the case may be), either—

(*a*) repay to the Company the cost incurred by them in providing, fixing, and laying such meter and main or extension of main as aforesaid, and so much of such service-pipe as aforesaid as shall be laid upon private property or in any other case beyond 30 ft. in length; or

(*b*) enter into a written contract with the Company (if required by them so to do) to continue to receive and pay for a supply of gas for a period of at least four years of such an amount that the rent payable for the same shall not be less than 25 per cent. per annum on the outlay incurred by the Company in providing, and fixing, and laying such meter and main or extension of main and service-pipe as aforesaid.

And in either case give to the Company (if required by them so to do) security for the payment to them of all moneys which may become due to them by such owner or occupier in respect of any such meter, main, extension of main or service-pipe provided and fixed or laid by the Company, and in respect of gas to be supplied by them.

(2) Notwithstanding anything contained in this section, it shall be lawful for the Company in any case in which they may think fit so to do, to provide at their own expense any such meter as aforesaid, and the whole or any part of so much of any service-pipe as shall be laid beyond 30 ft. in length.

(3) Section 11 of the "Gas-Works Clauses Act, 1871," shall not apply to the Company.

Annual meetings of the Company are provided for. [*Parliamentary Agents: Messrs. Dyson, Bell, & Co.*]

The HOYLAKE and WEST KIRBY URBAN DISTRICT COUNCIL Bill was dropped.

The Act of the LEICESTER CORPORATION confers powers to construct new works on scheduled land, having an area of 81 acres. The measure includes the modern form of residual clauses; also clauses giving the Corporation power to specify the size and materials of the pipes, with the fittings, which are to be laid by the consumer on his own premises either in the first instance, or on the occasion of any renewal between the Company's mains and the meter, so far as such pipes and fittings are intended to be covered over. In regard to pipes laid on the premises of any railway company, between the Corporation mains and the meter, the Corporation are under an obligation not to specify any size of pipe having less than an internal diameter of 2 in. The provisions applying to the application of gas revenues are as stated in the review of the Bill of Jan. 12 last. The powers to borrow include the £900,000 sought for in respect of the general purposes of the gas undertaking; but the period of repayment has been reduced from forty to thirty years. The powers to create accident funds in connection with the various undertakings of the Corporation also appear. The gas accidents fund is to be built-up by annual appropriations from revenue to the amount of £2000 per annum; the maximum amount of the fund being £100,000. [*Parliamentary Agents: Messrs. Dyson, Bell, & Co.*]

Mr. E. G. Stewart's Remarks at the Institution Meeting.—In the report on p. 203 of last week's "JOURNAL" of Mr. E. G. Stewart's remarks on the Sixth Report of the Gas Investigation Committee, the following sentences appear: "At Fulham, we have made measurements on our plant, and we find that we use a somewhat less amount of therms—1·44 per 1000 c.ft.—and the reason is quite obvious. Looking at the result, what you get in one way you lose in another; but we actually had 90 lbs. of steam by measurement," &c. This should have read: "At Fulham, we have made measurements on our plant, and we find that we lose a somewhat less amount of therms—1·44 per 1000 c.ft.—and the reason is quite obvious looking at the results. What you gain in one way you lose in another; but we actually had 90 lbs. of steam by measurement," &c.

Reducing Gas Waste.—According to Mr. Floyd Parsons, of New York, the American gas industry spends thousands of dollars each year in an effort to improve all gas-consuming appliances. One gas company last year spent $65,000 to reduce the waste of gas in the homes of its customers. Another concern used the phrase, "Matches are cheaper than gas;" and this little reminder has caused many people to extinguish needless flames, and then re-light the burners when there was work to be done. This far-sighted policy is based on the belief that waste of gas by faulty appliances or otherwise, causes high gas bills; and high gas bills breed complaints. Complaints mean letter writing, delayed payments, and dissatisfied customers. The companies believe that satisfied customers mean more to them than the smaller revenue that might come from the excessive use of gas.

STEAMING IN VERTICAL GAS-RETORTS.

A WRITTEN CONTRIBUTION TO THE DISCUSSION ON SIR GEORGE BEILBY'S PAPER.

By Dr. A. PARKER, of the Department of Coal Gas and Fuel Industries, Leeds University.

IN forwarding the following written contribution by Dr. A. Parker, of Leeds, to the discussion on Sir George Beilby's Institution paper on "Steaming in Vertical Gas-Retorts," Mr. Walter T. Dunn says the Council of the Institution have given their approval to its publication in the Technical Press.

IT is gratifying to find that, in general, the results given by Sir George Beilby in his report on "Steaming in Vertical Gas-Retorts" confirm those previously obtained in a similar investigation by the Research Sub-Committee of the Institution of Gas Engineers. At the same time there are points in the report which require further explanation. It is intended to direct attention to some of these points in this contribution to the discussion.

The report could apparently have been made much more complete with very little extra work. Shortage of time was presumably responsible; but in that case it might have been preferable to have carried out fewer tests and made these more complete by obtaining the whole of the data necessary for the construction of full thermal and chemical balances, in order that the true value of the tests could have been seen at a glance. It is claimed that attention has been directed mainly to the practical issues of the problem as affecting the gas industry; but no references appear in the report with regard to the effect of steaming on the amounts of sulphuretted hydrogen, hydrocyanic acid, and naphthalene in the crude gas—information which is very important in everyday works practice. Apparently the gas made in each test was measured before purification, so that in order to obtain the yields of purified gas (and one would assume that the necessary corrections have been made), the amounts of sulphuretted hydrogen in the crude gas must have been determined and could therefore have been included in the report.

WEIGHT BALANCES AND EVALUATION OF TESTS.

In the Uddingston Report, those results only were accepted from which satisfactory thermal and chemical balances could be constructed; but in the tests at the Fuel Research Board's Station, weight balances alone were used as the criterion of reliability. It will be agreed that weight balances in themselves cannot form so sure a guide as thermal and chemical balances, inasmuch as the former must be vitiated by the amounts of air entering the plant and the gas losses which must occur when working at or near level gauge. Thermal and chemical balances, however, although not a perfect check, form a fairly reliable criterion when considered together. The most severe reliability test is obtained by a comparison of the values deduced for the net heat of decomposition of a given coal in a series of tests, by calculation from the heat balances of the retort furnace and by calculation from the data given in thermal and carbon balances, according to the methods described in the Uddingston Report. The average of five values of the net heat of decomposition of Lanarkshire coal calculated from the results of the Uddingston tests by the first method, differed by only 1·1 p.ct. of the calorific value of the coal from the average value calculated by the second method; and the whole of the ten figures were within 1·8 p.ct. The values calculated by the two methods from the results obtained for Lanarkshire coal at the Fuel Research Board's Station (Tests J and K), however, differ by approximately 6 p.ct. of the calorific value of the coal.

Attention must be directed to the statement in the Fuel Research Board's Report that weight balances constructed from the Uddingston tests show losses varying from 4·7 to 13·5 p.ct. This statement, in itself, is decidedly misleading, for if the necessary corrections are made for the amounts of steam which escaped through the doors of the coke chambers, and which were given in the water balances in the Uddingston Report (Table IX.), it is found that the losses as deduced from weight balances all fall within 5 p.ct. Although the losses in the weight balances constructed from the tests by the Fuel Research Board lie between − 1·4 p.ct. and + 2·4 p.ct., it will be shown later from water-balances which have been made out, that in all probability steam losses did occur in Tests B, C, H, and K to the following approximate amounts—

Test	B.	C.	H.	K.
Steam loss as percentage of weight of coal	2·2	3·8	3·2	4·0
" " " " steam	42·0	17·9	10·5	16·4

THERMAL BALANCES AND EFFICIENCIES OF GAS PRODUCTION.

Thermal balances, in which the heat values in the various items are expressed as percentages of the heat of combustion of the coal used, have been constructed from the results of the tests by the Fuel Research Board, and are given in Table A. The figures against the item "Fuel for steam" have been calculated on the basis of a 70 p.ct. boiler efficiency, as in the balances given in the Uddingston Report. It will be observed from Table A that the amounts of heat unaccounted for, due allowance being made for the heat absorbed in the steam-carbon reaction, vary between 1·1 and 7·2 p.ct.—a much greater variation than appears in the weight balances, as against the limits of 2·4 and 5·0 p.ct. in the Uddingston tests. The efficiencies of gas production, calculated according to the method adopted in the Clerk-Smithells-Cobb report to the President of the Institution in 1919, have been included in Table A, since it is believed that these figures form the most useful guide to the thermal efficiency of the process from the standpoint of the gas industry. It will be seen from these figures that the efficiency of gas production has increased with steaming in Tests A, B, and C with Durham coal, and that the maximum efficiency with Mitchell Main coal appears in Test G with 20 p.ct. of steam. The efficiencies obtained in Tests J and K with Lanarkshire coal, however, are both 59·4 p.ct.; whereas in the tests carried out at Uddingston, it was found that the efficiency rose with increased steaming from 54·4 to 62·1 p.ct. and then began to fall, the maximum of 62·1 p.ct. being obtained when approximately 20 p.ct. of steam was passed through the retorts.

WATER BALANCES.

Water balances constructed from the figures given in the Fuel Research Board's Report are given in Table B. It seems reasonable to assume that the figures against the difference item "Water formed by distillation of coal" should be approximately the same in tests with the same coal, provided losses of steam by leakage were negligible. This assumption receives considerable support from the balances for Tests D, E, F, and G, which show approximately 150 lbs. of water produced on the distillation of 1 ton of dry coal. The figure against this item in Test H, however, is only 74 lbs., which leads to the conclusion that there was probably a loss of approximately 70 lbs. of steam per ton of coal in this test. Similarly it may be concluded that steam losses occurred in Tests B, C, and K to the extent of 50, 86, and 90 lbs.

TABLE A.—*Thermal Balances P.Ct.*

[Heat of combustion of coal = 100.]

COAL	CONSETT.			MITCHELL MAIN.					LANARKSHIRE.	
TEST	A.	B.	C.	D.	E.	F.	G.	H.	J.	K.
Steam	*Nil*	0·4	1·7	*Nil*	0·4	1·0	1·6	2·4	*Nil*	2·0
Coke	67·9	65·6	66·6	67·4	60·5	60 1	60·3	55·7	64·9	54·2
Tar	5·2	5·6	6·2	5·4	6·6	6·8	7·4	7·7	9 3	11·5
Gas	22·2	23·3	25·7	23·2	26·6	31·6	33 2	35·5	22 8	29·0
	95·3	94·5	98·5	96·0	93·7	98 5	100·9	98 9	97 0	94·7
Less fuel for steam	*Nil*	0·6	2·4	*Nil*	0·6	1·4	2·3	3·4	*Nil*	2·9
" " setting	14·2	13 2	14·8	14·9	12·8	14·9	16·0	17·1	12·6	11·6
	14·2	13·8	17·2	14·9	13·4	16·3	18·3	20·5	12·6	14·5
Heat content of products available for sale	81·1	80·7	81 3	81·1	80·3	82·2	82·6	78·4	84·4	80·2
Heat used and lost in manufacture	18·9	19·3	18·7	18·9	19·7	17·8	17·4	21·6	15·6	19·8
	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0
Heat absorbed in steam-carbon reaction	*Nil*	0 1	0·9	*Nil*	0·9	1·6	2·0	2·4	*Nil*	1·4
Total thermal loss—per cent.	4·7	5·6	2·4	4·0	7·2	3·1	1·1	3·5	3·0	6·7
Efficiency of gas production—p.ct.	54·0	54 7	57 9	55 1	57·5	64 0	65·6	62·2	59·4	59·4
Efficiency of carbonization—p.ct.	81·1	80·7	81·3	81·1	80·3	82·2	82·6	78·4	84·4	80·2

TABLE B.—*Water Balances in Lbs. per Ton of Coal (Dry Basis).*

Coal	Consett.			Mitchell Main.					Lanarkshire.	
Test	A.	B.	C.	D.	E.	F.	G.	H.	J.	K.
Water in gas at 60° Fahr. and 30 in.	12	12	15	11	14	18	20	22	11	18
Liquor collected	243	300	514	266	270	314	426	472	531	778
Steam decomposed	*Nil*	8	128	*Nil*	116	221	295	357	*Nil*	215
	255	320	657	277	400	553	741	851	542	1011
Steam supplied to retorts	*Nil*	119	479	*Nil*	114	282	464	681	*Nil*	547
Water to scrubber	136	133	125	108	117	78	114	67	117	133
Moisture in coal	28	27	48	23	18	25	19	29	245	241
Water formed by distillation of coal (difference)	91	41	5	146	151	168	144	74	180	90
	255	320	657	277	400	553	741	851	542	1011
Steam decomposed as percentage of steam to retorts	..	6·7	26·7	..	100	78·4	63·6	52·4	..	39·3

respectively. The amounts of steam decomposed, expressed as percentages of the amount of steam passed through the retorts, are also given in Table B. The figures for percentages of steam decomposed in the tests with Mitchell Main coal compare very well, when differences in temperatures of carbonization are considered, with the following cracking efficiencies obtained in the Uddingston tests, due allowance being made in the latter tests for losses of steam by leakage—

Uddingston Test No.	2.	3.	4.	5.
Steam through retorts as percentage of coal as charged	6·0	11·3	21·8	23·7
Steam decomposed as percentage of steam through retorts	83·6	64·0	48·6	48·7

It is difficult to understand, however, why only 6·7 p.ct. of the steam used was decomposed in Test B and only 26·7 p.ct. in Test C with Durham coal at the Fuel Research Board's Station. Even allowing the possibility that lower cracking efficiencies might be obtained with Durham coal than with Yorkshire or Lanarkshire coals, a higher efficiency should have been obtained with the smaller proportion of steam in Test B.

Chemical Balances.

The information in the Fuel Research Board's Report is insufficient to enable chemical balances showing the distribution of carbon, nitrogen, and sulphur in the several tests to be constructed, since the results of ultimate analyses of the tar obtained and the amounts of sulphuretted hydrogen in the crude gas are not given. It has been possible, however, to construct balances showing the distribution of carbon and nitrogen for Tests J and K with Lanarkshire coal by assuming that the proportions of these elements in the tar were the same as obtained in the Uddingston tests. This assumption seems quite reasonable, since considerable errors in the figures adopted would have very little effect on the balances. The balances thus obtained are given in Table C. The carbon balances show losses of − 0·9 p.ct. in

TABLE C.—*Distribution of Carbon and Nitrogen.*

Coal	Lanarkshire.			
Test	J		K.	
Carbon—				
Coal		100		100
Coke	80·54		68·29	
Tar (assumed 85 p.ct. in dry tar)	8·75		10 85	
Liquor (assumed)	0·34		0·34	
Gas	11·27		18·18	
Loss	*minus* 0·90		*plus* 2·34	
		100		100
Nitrogen—				
Coal		100		100
Coke	56·11		61·35	
Tar (assumed)	10·58		12·18	
NH_3 in liquor)	28 34		34 73	
Cyanide in liquor and gas (assumed)	3·14		2·86	
Gaseous nitrogen and loss	*plus* 1·83		*minus* 11·12	
		100		100

Test J and + 2·34 p.ct. in Test K, against + 3·0 and + 6·7 p.ct. respectively in the thermal balances in Table A. The nitrogen balances show that in Test J only 1·83 p.ct. of the nitrogen originally present in the coal remains to account for the sum of the working loss and the free gaseous nitrogen which must have been produced. In the case of Test K, the products coke, tar, ammonia, and cyanide apparently contain 11·12 p.ct. more nitrogen than was originally present in the coal; the discrepancy would be even greater if due allowance were made for the free gaseous nitrogen produced. Possibly the yield of ammonia in Test K is too high, for it represents approximately 7·6 lbs. of ammonium sulphate per ton more than was obtained in similar tests at Uddingston.

Heat Losses by Radiation, Convection, &c.

The heat losses by radiation, &c., from the setting of four retorts at the Fuel Research Board's Station were found to be several times greater than the figures assumed to represent the losses from the setting of eight retorts at Uddingston. This was to be expected, since the percentage losses by radiation, &c., must be very much greater from an isolated setting of four retorts than from one of three settings of eight retorts. The following statement on this matter, however, appears in the Fuel Research Board's Report.

"In the case of the Uddingston settings it is impossible without further information accurately to allocate the loss between the flue gases and radiation, &c. It seems doubtful, however, whether the losses from radiation, &c., would ever fall as low as either 10 or 7·5 p.ct., which are the figures suggested in the Uddingston Report."

By combining the results obtained in Test J (Table 9) at the Fuel Research Station with those obtained in Test I at Uddingston, it seems a simple matter to calculate the losses by radiation, &c., from the Uddingston setting with a fair degree of accuracy. The method of calculation is given below.

Fuel Balance.

Uddingston Test I—Lanarkshire Coal without Steam.

Fuel to producer, therms per ton of coal (dry basis)—Uddingston Test I	33·80
Heat in therms carried away by waste gases—Uddingston Test I	16·72
Heat taken up by coal in therms per ton—Fuel Research Board Test J	12·27
Losses by radiation, &c., in therms (difference)	4·31
	33·80
Losses by radiation, &c. as percentage of fuel to producer	12·76

This calculation shows that the losses by radiation, &c., in Uddingston Test I. amounted to 12·76 p.ct. of the fuel to the producer, which is good agreement with the value of 10 p.ct. assumed in the Uddingston Report. With the figure of 12·76 p.ct. as a starting point, it is possible approximately to calculate the losses by radiation, &c., in the four other tests given in the Uddingston Report. The figures showing the method of calculation adopted are given in Table D, in which the necessary allowances have been made for the differences in temperature of carbonization.

TABLE D.—*Losses by Radiation, &c., from Uddingston Setting.*

Uddingston Test No.	1.	2.	3.	4.	5.
Fuel to setting in therms per ton coal	33·8	33·7	35·0	36·8	39 7
Coal carbonized in tons per hour	0·940	0·973	1·110	1·027	0·927
Fuel to setting in therms per hour	31·8	32·8	38·8	37·8	36·8
Loss by radiation, &c., in therms per hour	4·06	3·17	3·60	3·72	2·66
Loss by radiation, &c., as percentage of fuel to setting	12·8	9·7	9·3	9·8	7·2

From this table it may be seen that the calculated losses by radiation, &c., in Uddingston Tests 2, 3, 4, and 5 were respectively 9·7, 9·3, 9·8., and 7·2 p.ct. which are in good agreement with the assumed values of 10 p.ct. in Test 2 and 7·5 p.ct. in Tests 3, 4, and 5.

Fuel Gas, Waste Gas, and Excess Air for Combustion.

An examination of the analyses of the gases given in Table 7 of the Fuel Research Board's Report reveals the fact that the water gas used to heat the setting was in most instances of unusual composition, as shown not only by the small amounts of carbon dioxide, but also by the high percentages of carbon monoxide compared with the amounts of hydrogen. It was therefore decided to calculate the amounts of excess air required in the combustion of these gases to produce waste gases of the compositions given in Table 7, by two methods: First from carbon balances

and secondly from oxygen balances, in order to determine whether the amounts of excess air as calculated by the two methods

Excess Air used in Combustion of Fuel Gases.
*Fuel Research Board's Station.**

Test	B.	C.	D.	E.	F.	G.	J.	K.
Calculated from carbon balance—p.ct.	26·0	26·0	31·4	32·3	29·0	35·7	39·6	23·9
Calculated from oxygen balance—p.ct.	20·0	21·8	25·4	23·5	23·6	32·0	38·4	21·0
Difference	6·0	4·2	6·0	8·8	5·4	3·7	1·2	2·9

* Calculations could not be made for Tests A and H since the fuel gas analyses total respectively 100·90 p.ct. and 99·15 p.ct., and not 100·0 p.ct. and 99·75 p.ct. as given in the report.

showed reasonable agreement with one another. It may be seen from the values obtained that those deduced from oxygen balances are identical with the values given in the Fuel Research Board's Report. The results by the two methods of calculation, when water gas is used to heat the setting, should agree within 2 p.ct., provided satisfactory methods of sampling and analysis were employed; but only in the case of Test J is such satisfactory agreement obtained. The differences in the other tests are much greater than can be accounted for by ordinary experimental error, and in one instance (Test E) the difference amounts to as much as 8·8 p.ct.

The following figures show the results of similar calculations from the compositions of the fuel gases and waste gases in the tests at Uddingston. In Tests 1 and 2 the setting was heated by

Excess Air Used in Combustion of Fuel Gases.
Uddingston Tests.

Fuel Gas Used	Producer Gas.		Purified Coal Gas.		
Test No.	1.	2.	3.	4.	5.
Calculated from carbon balance—p.ct.	10·6	19·5	38·7	42·4	49·1
Calculated from oxygen balance—p.ct.	10·4	19·1	39·8	42·3	45·8
Difference	0·2	0·4	1·1	0·1	3·3

producer gas, in which case agreement within 1 p.ct. should be obtained. The results differ by only 0·2 and 0·4 p.ct. In Tests 3, 4, and 5, when the setting was heated by purified coal gas, agreement closer than 4 or 5 p.ct. cannot be expected owing to the necessary assumptions with regard to the nature of the hydrocarbons present. The results actually show differences of only 1·1, 0·1, and 3·3 p.ct.

In view of the fact that the calculated amounts of excess air given in the Fuel Research Board's Report vary from 12·9 p.ct. in Test A to 38·4 p.ct. in Test J, it is surprising to find the following statement in the report:

"The results of analyses of flue gases are shown in Table 7, where it is seen that the proportion of fresh air was kept approximately the same in each test."

Comparison of Heating Values of Water Gas and Producer Gas.

In Appendix III. of the report on the tests at the Fuel Research Station, an attempt is made to compare the heating values of water gas and two typical producer gases. For this purpose it is assumed that 10 p.ct. of excess air was used for combustion in each case. There appears to be no justification for this assumption, for the amounts of excess air used in the tests at the Fuel Research Board's Station average 30·5 p.ct. and 25·7 p.ct. according to whether the calculations are made from carbon or oxygen balances. Moreover, experience seems to show that with settings as at present designed, smaller amounts of excess air are required for the satisfactory combustion of producer gas than for water gas or coal gas. The excess air used for the producer gas at Uddingston averaged 14·9 p.ct.; and for coal gas the average was 43·0 p.ct.

Flow of Steam through Nozzles and Orifices.

Attention must be drawn to the following statement which appears in the Report of the Fuel Research Board

"It has been considered desirable to give the information with regard to diameters of orifices in the steam diaphragms together with reduced pressure and boiler pressure, for the information of gas engineers. These data were made use of in calculating the quantity of steam passed into the retorts at Uddingston, but were in no way used at the Research Station, where the water fed into a special boiler was weighed hour by hour."

This statement is quite misleading. The amounts of steam emitted at different pressures from the nozzles used at Uddingston were obtained by previous direct calibrations with the pressure-gauge actually used in the tests, as clearly described in Appendix I. of the Uddingston Report. The figures given for steam used were therefore the result of direct calibration and not calculation.

The information with regard to the diameters of orifices in the steam diaphragms and the pressures used at the Research Station would have been of more service if it had been supplemented by scale section drawings, since, as is well known, the flow of steam through a nozzle or orifice varies considerably with the design. Provided that the absolute pressure at the outlet is less that 0·546 of the absolute pressure at the inlet, the discharge of steam through a nozzle, in lbs. per minute, may be represented by the expression

$$W = 18{\cdot}93\, k\, A\sqrt{\frac{P}{V}}$$

The rates of discharge of steam per square inch of throat area of the nozzle for values of the dryness fraction from unity to 0·8, as calculated from this expression when $k = 1$, are given in Section III. of the Sixth Report of the Gas Investigation Committee, to which reference should be made. With nozzles of correct stream-line design, the discharge coefficient k is approximately unity; but with other designs, the value of k is less than unity, and may be much lower when the steam is discharged through an orifice in a plate. The Callendar expression should be applicable at the steam pressures in the Fuel Research Tests B, C*, E, G, H, and K. The figures for these tests have therefore been used for the calculation of the values of the discharge coefficients for the orifices of $\frac{3}{32}$ in. and $\frac{5}{16}$ in. dia. The calculations lead to the following values of k on the assumption that the steam was dry-saturated.

Test	B.	E.	G.	H.	K.
Discharge coefficient, k	0·98	0·96	0·42	0·46	0·47
Diameter of orifice in inches	$\frac{3}{32}$	$\frac{3}{32}$	$\frac{5}{16}$	$\frac{5}{16}$	$\frac{5}{16}$

The value of k for the $\frac{1}{16}$ in. orifice is approximately 0·45, which means that at a given pressure the rate of discharge of steam is less than half that obtainable with a nozzle of stream-line design. The value of k for the $\frac{3}{32}$ in. orifice, which is approximately 0·97, is much higher than would have been expected for an orifice in a plate. It is clear from these figures, however, that exact dimensional drawings are required to enable even approximate reproduction of the steam-flow conditions on any other installation.

Yields of Gas in Tests A, B, and J.

It is surprising to find that steaming to the extent of 5 p.ct. of the weight of the coal in the case of Durham coal, Tests A and B, caused an increase in the calorific value of the gas made from 510 to 518 B.Th.U. gross, as against a decrease in the calorific value of the gas with Mitchell Main coal from 544 to 517 B.Th.U., and a decrease from 544 to 482 B.Th.U. per c.ft. with 6 p.ct. of steam in the Uddingston tests. It is also to be noticed that 5 p.ct. of steam has only caused an increase in gas-make of 330 c.ft. per ton of Durham coal, whereas the increases were over 3000 c.ft. with the other two coals. The peculiarities of the results of Test B with Durham coal are further brought-out in the following Table E, which shows the actual volumes of the constituent gases produced in Tests A, B, and C together with the volumes of extra gas resulting from steaming. Apparently less hydrogen was produced in Test B than in Test A, whereas an increase of over 1000 c.ft. per ton of coal would have been anticipated. Attention has already been drawn to the fact that in Test B less than 7 p.ct. of the steam used was decomposed; and this is accounted for in the increased yields of tar and ammonia.

Table E.—*Volumes of Constituent Gases in Cubic Feet per Ton of Coal.*

Fuel Research Test	A.	B.		C.	
—	C.Ft. per Ton.	C.Ft. per Ton.	Excess over A.	C.Ft. per Ton.	Excess over A.
Constituent gases—					
CO_2	126	238	112	751	625
C_mH_n	265	326	61	359	94
O_2	33	54	21	43	10
CO	1,075	1,229	154	2,152	1077
H_2	7,784	7,630	*minus* 154	9,768	1984
CH_4	3,209	3,233	24	3,278	69
N_2	756	870	114	700	*minus* 56
	13,248	13,580	332	17,051	3803

The calorific value of the gas obtained in Test A with Durham coal is low for straight coal gas. The same point is noticeable in Test J with Lanarkshire coal, which gave a straight coal gas of only 518 B.Th.U. gross, as against 544 B.Th.U. in the Uddingston test without steam.

The yield of straight coal gas in Test J, 11,800 c.ft. per ton, is high for Lanarkshire coal containing 10 p.ct. of moisture. It is much higher than the yield of 9367 c.ft. obtained in the Uddingston test; and this latter figure compares well with the yield of 9670 c.ft. previously obtained in horizontal retorts and the figure of 9870 c.ft. obtained in 1915† by Mr. F. J. Kennedy in Glover-West retorts at Uddingston with 5 lbs. steam-pressure on nozzles of $\frac{1}{16}$ in. dia. A possible explanation of the difference in the yields of straight coal gas obtained with Lanarkshire coal at the Research

* The value of k for the $\frac{5}{16}$ in. orifices used in Test C. has not been calculated, since there appears to be an error in the steam pressure given for this test in Table I. According to the Table, a steam pressure of 21 lbs. per sq. in. in Test C. delivered 10·45 tons in 120 hours, as against 15·1 tons in the same time in Test H. at a steam pressure of 21·5 lbs. per sq. in.

† John West, Southern Association of Gas Engineers and Managers, November, 1917.

Station and at Uddingston is indicated in the following statement in the report of the Fuel Research Board in reference to Test J:

"No difficulty in carbonization was met with during the test, but an unsatisfactory weight balance resulted, namely a gain of 1·4 p.ct. on the total. It would appear from these results, and from others obtained during similar tests with no steam passing through the retorts, that this gain is due to mixed fuel and flue gases finding their way into the retort from the combustion chambers. This conclusion has been arrived at after very careful consideration of all other possible causes of error."

Errata in the Report.

It is very difficult in the preparation of a report of the kind presented by the Fuel Research Board to ensure that it is free from errors; but for the convenience of others reading the report, a list of what are believed to be errors is appended.

Table 1.	Test A.	Therms in gas, 68·04 should read 67·63.
	Test K.	Specific gravity of gas, 0·447 should read 0·477.
Table 3.	Test E.	Proximate analysis of coal totals 90·00.
Table 5.	Test G.	,, ,, ,, coke ,, 100·70.
	Test H.	,, ,, ,, ,, ,, 99·99.
	Test D.	Ultimate ,, ,, ,, ,, 101 00.
Table 6.	Test A.	Analysis of tar distillation totals 100·10.
Table 7.		Ammonia in grms. should read ammonia in grs.
	Test A.	Fuel gas analysis totals 100 90 not 100·00.
	Test H.	,, ,, ,, ,, 99·15 ,, 99·75.
	Test K.	,, ,, ,, ,, 99·75 ,, 100·00.
Table 9.	Test D.	Heat taken up by coal, 4·04 should read 4·14.
	Test E.	,, ,, ,, ,, 3·11 ,, ,, 3 10.
	Test K.	,, ,, ,, ,, 12·45 ,, ,, 11·67.
	Test D.	,, ,, ,, ,, per cent. of heat added 21·1 should read 21·7.
	Test K.	,, ,, ,, ,, per cent. of heat added 56 4 should read 50·7.
	Test D.	Heat taken up by coal per ton 9·62 should read 9·86.
	Test K.	,, ,, ,, ,, 20·28 ,, ,, 19·01.

Page 27, line 15. 0·68 p.ct. should read 0 068 p.ct.

LOW-TEMPERATURE CARBONIZATION AND THE PRODUCTION OF SMOKELESS FUEL.

By invitation of the Chairman (Sir Henry Goold-Adams) and the Directors of Low-Temperature Carbonization, Ltd., representatives of the Technical Press paid a visit last Wednesday to the works of the Company at Barugh, near Barnsley, for the purpose of inspecting new plant now in use for the manufacture of smokeless fuel.

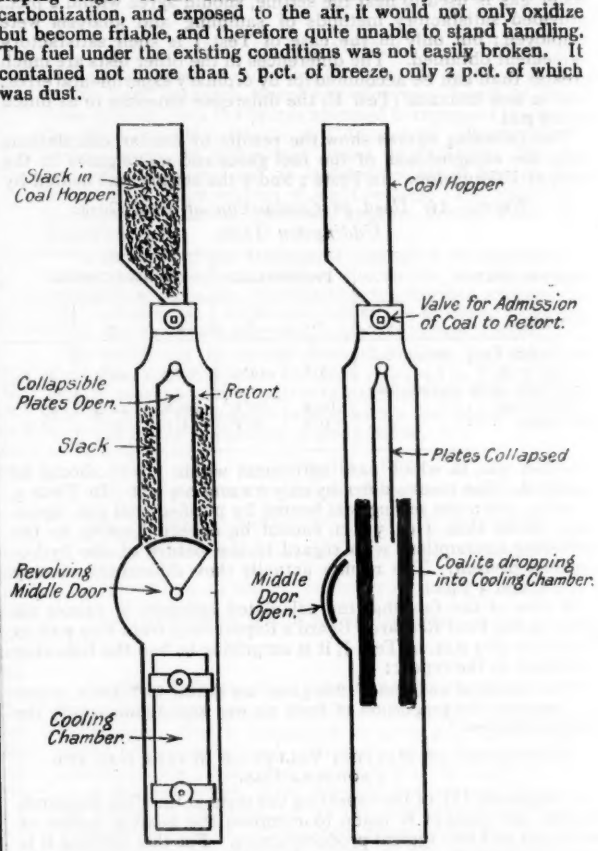
The visit was arranged in connection with what is claimed to be a "recent and remarkable commercial development of low-temperature carbonization of small or slack coal and the conversion in a practical and economical form of the comparatively waste product into an article of high fuel value." Major Hamilton, M.P., on behalf of the promoters, welcomed the party, and stated that on inspecting the works, which had been operating successfully and without a hitch for some ten weeks, they would see in the way of smokeless fuel something which was totally different from anything they had previously known as "Coalite." Since the firm of Messrs. Close Bros. & Co. and their friends took over the operation of the works early this year, important discoveries and improvements have been made. The continuous and effective working of the plant as a result of these discoveries over the past ten weeks made them believe that future success was assured. The problem of the manufacture of a satisfactory smokeless fuel had been solved, and those who had already seen the works were agreed on this point.

The chief plant which they were about to inspect consisted of a battery of twenty vertical retorts, producing 110 tons of Coalite per week. This unit of twenty retorts might be regarded as experimental; and the intention was to increase the number to two hundred retorts—provision having been made on the site for the extension.

Their principal object was to produce a smokeless and useful domestic fuel; and he considered that their Coalite was the best that had ever been known. A stock of about 120 tons was in the yard, and some of it was burning in the office and other grates which could be inspected. The coal used consisted of 70 p.ct. of non-coking and 30 p.ct. of coking slack. This was washed in an ordinary colliery washing plant, in order to reduce the ash in the resultant fuel. It was then passed to an overhead bunker, and allowed to drain for twenty-four hours—reducing the moisture content to about 6 p.ct. The conveyor plant was not yet completed; but, temporarily, the coal was conveyed to the retort-battery hoppers by small trucks travelling along a gantry.

The important improvements to which he referred were in connection with the retorts themselves. The difficulties in the past had been to procure the easy and rapid discharge of the smokeless fuel after carbonization, and when discharged to obtain it in a state that would minimize breeze production and permit of handling and transport. The Coalite had previously to be rammed and pushed out of the retort, causing not only delay but breakage of the fuel. These difficulties had been overcome by the device patented by Mr. T. M. Davidson, which he would explain by means of a diagram. Each retort was provided with two collapsible metal plates placed vertically in its interior, and dividing it into three spaces. The two chambers or spaces lying between the plates and retort walls, each measuring about 4 in. in width, received the fuel; while the central space allowed for the passage of the gas from the fuel through perforations in the plates. By the adoption of Mr. Davidson's collapsible plates—made to close inwards by an overhead lever—the fuel, although at the point of its greatest expansion at about 600° C., was freed, and dropped readily through an open rotary door into the chamber below. The resultant Coalite was firm, and would stand handling and transport, as they would realize on inspection.

The retorts were equipped with overhead charging bunkers, and fitted top and bottom with gas-tight retort doors, while underneath the retorts were receiving chambers in which the Coalite was left to cool. Cooling was effected in about two hours; but the Coalite was usually allowed to remain in the chamber till the succeeding retort charge was ready to come down. The fuel was then raked through the coke-doors on to an outside sloping stage. If the Coalite were immediately withdrawn after carbonization, and exposed to the air, it would not only oxidize but become friable, and therefore quite unable to stand handling. The fuel under the existing conditions was not easily broken. It contained not more than 5 p.ct. of breeze, only 2 p.ct. of which was dust.



Section of the Davidson Low-Temperature Expansible Retort.

[See "Journal" for May 18, p. 384.]

The receiving chambers were divided from each other by water jackets; and the heated water afforded low-pressure steam, which could be utilized for the distilling of tar and the manufacture of producer gas. The retorts were designed originally to take 15 cwt. of slack; but when used with the vertical plates the quantity was reduced to 10 cwt., which would carbonize in seven to eight hours. The Coalite obtained amounted to 7 cwt., or 14 cwt. per ton of slack carbonized. The battery was gas heated, and the temperature in the heating flues was about 550° C. While they used their own gas, they employed for starting and stand-by purposes Mond producer gas.

Major Hamilton stated that they regarded smokeless fuel as the chief product; the bye-products (gas and tar oil) being of less importance in the process. Nevertheless they were of some value to them. The production of gas amounted to 6000 c.ft. per ton with a calorific power of 700 B.Th.U. This was exhausted from the retorts, and passed through hydraulic mains, water coolers, and scrubbing plant to the gasholders, whence after measurement it was drawn for heating the retorts and was otherwise available for many purposes.

It should be noted that the two plates in the retort provide a central chamber into which through perforations the evolved gas and oils easily pass, thus avoiding the depreciation which would take place had they to traverse the red-hot fuel itself. As the number of retorts increased, the gas would become more constant in character, and be of great service to gas undertakings working in the vicinity of the plant. It would not only help them as to

supply, but by admixture would much improve the quality of the town's gas.

Referring to the tar oils, the speaker gave it as his opinion that low-temperature tar was more valuable than that produced under high-temperature conditions. Some 50 p.ct. of tar oil produced was recovered in the overhead hydraulic main, 30 p.ct. in the water-cooled plant, and the remaining 20 p.ct. by means of a Pelouze and Audouin apparatus. The total production varied from 15 to 22 gallons per ton, according to the class of slack used. They obtained from the tar oils 2 or 3 gallons of motor spirit, 8 to 9 gallons of lubricating oil, and an equal quantity of fuel oil suitable for Diesel engines.

Major Hamilton then referred to the slack which it is possible to use in the plant as devised. Non-coking slack, which was employed to the extent of 70 p.ct., was practically unmarketable, and they were therefore able to obtain it at a low figure—about 6s. or 7s. per ton. The possible sale of such fuel would ease the position of collieries and indirectly tend to cheapen coal. The Coalite plant was small, but was the nucleus of what might be considered the greatest development in the country.

The visitors were enjoined to make the inspection with an open mind, and they were at liberty to ask any questions which occurred to them. He wished to emphasize the fact that their object was to use only slack for the production of Coalite. The latter was a valuable domestic fuel, free from smoke, and clean to use. If employed in place of coal, it would help in conserving the fuel of the country, and at the same time render the atmosphere purer and better for all.

The speaker enlarged on the value of Coalite. It contained only 6 p.ct. of ash compared with 12 p.ct. or more in the case of coal. The 14 cwt. of Coalite produced per ton of slack was about equal in bulk to 28 cwt. of coal, and was more effective for domestic purposes than that quantity. The Major read from the "JOURNAL" of the 12th inst. (p. 87) the passage relating to enquiries by Dr. Margaret Fishenden into some of the problems of domestic heating, in which tests of the comparative radiant efficiencies of coal and smokeless fuel showed the marked advantages of the latter. The increased efficiency of Coalite (the fuel tested) was 30 to 40 p.ct., and the user therefore gained considerably. He did not consider that Coalite was in competition with the products of gas, electricity, and other undertakings, since there was room for them all.

Mr. T. M. Davidson, the patentee of the collapsible retort plates, briefly addressed the company, directing their attention to the great advantage of the central space provided by the two perforated vertical plates. This permitted the easy passage of the gas up the centre of the retort, thereby lessening the possibility of leakage into the flues and consequent excess temperature therein. The gas left the retort comparatively cool.

The party, accompanied by Prof. H. E. Armstrong, was then conducted round the works, inspecting successively the mixing of the coking and non-coking slack, the washer elevating plant, draining hopper, retort battery, water coolers, tar tanks, exhauster house, &c. Chief interest centred in the retort battery, the character of which had been indicated in Major Hamilton's address. This consisted of twenty vertical retorts, each measuring internally 9 ft. high, 6 ft. 6 in. from front to back, and 11 in. in width. The burner tubes or flues are horizontally placed one above another between the retorts; the spent gases passing downwards at the end of each horizontal journey into the similar flue below—being regenerated at each downward passage by supplementary burners, until they reach the bottom of the retort, when they enter the recuperators situated on either side of the battery, where they pass upwards and downwards through the recuperators, counterflow to the primary air supply. The air by this means is preheated for the burners. The spent gases finally pass down between the water jackets to the main flue, having parted with most of their heat prior to leaving the battery.

In answer to inquiries, it was stated that some 3000 c.ft. of the 6000 c.ft. of gas produced were used for heating, or rather less than 2½ million B.Th.U. per ton of coal. This compared with 3 million units used in high-temperature coke-oven practice. The surplus gas for the time being was allowed to escape into the air. The tar flowed away easily to the storage tank. Its specific gravity was given as 1·06, and water content 6 p.ct. The sulphate of ammonia recoverable was given as 12 lbs. per ton of slack; but since the ammonia had not yet been recovered and worked into sulphate, this figure was furnished as an estimate.

The Coalite was withdrawn in 4-inch slabs, due to the construction and width of the carbonizing chamber. The work was manual, rakes being used, and the fuel being then heaped ready for transport.

In response to inquiries, it was stated that the washed slack (70 p.ct. of Clay Cross and 30 p.ct. of Silkstone) had a volatile content of 33 to 35 p.ct., ash 4 to 5 p.ct., and the balance fixed carbon. The Coalite product contained 8 to 10 p.ct. of volatile matter, and 5 to 7 p.ct. of ash. The B.Th.U. value of the fuel was given as substantially the same as coal—the average being 13,500 B.Th.U. per pound.

Major Hamilton said that, taking coal as having 30 million heat units per ton, they obtained 22 millions in the Coalite and 3 millions in the tar oils—an average 82½ p.ct. efficiency in the process. This was claimed to be higher than had been obtained in any other process of carbonization; and he instanced 72 to 75 p.ct. efficiency for ordinary gas-works practice.

It was stated that at the present time £5 per ton delivered in London was being obtained for the Coalite made by the Company; but in the ordinary way it was anticipated that at least anthracite prices would be realized.

The question of financial results naturally suggests itself after an inspection of the plant. As the Coalite was regarded as the important product, these depend not only upon capital charges and the expenditure incurred in production, but on the amount obtained for the fuel. It must be a point whether the domestic customer (and certainly any steam-user) will be willing to pay prices which are higher than those charged for household and industrial coal respectively. The claimed advantages of the increased bulk, radiant efficiency, and cleanliness are not likely to be taken into account by the majority of those who are in the habit of using coal.

On the question of the cost of producing Coalite, information would be interesting and welcome. The price of slack coal, in the present state of the market (due to abnormal circumstances) is comparatively low, and its effect can be calculated. The Barnsley installation is, apart from the retort-battery, similar to that of a high-temperature coke-oven plant; and it has been taken that the expense of working is practically the same. It was noted, however, that the men working (presumably in eight-hour shifts) on the battery of twenty retorts were four in number—two overhead and two on the ground level. This number, with the relatively small throughput per retort, rather suggests that the cost per ton would be greater than in coke-oven practice.

The movable plates in the retort chamber are obviously subject to heat, and time is required to prove their durability from the point of view of performing their special work; and as was gathered from Major Hamilton's remarks, it is on this function that the character—that is, uniformity of texture and sufficient hardness to prevent breeze formation—of the Coalite depended. The estimate of three years' durability would appear to be on the sanguine side. The plates, ribbed on the gas chamber side, are made of steel to specification.

The question of capital charges has also to be considered; and it would be interesting (were figures available) to note their incidence on the cost of the Coalite produced.

From the point of view of gas engineers, it does not seem that the gas-fire, readily lighted and extinguished with similar advantages as to radiant efficiency and cleanliness, and with a cost not greatly in excess of a coal fire, will be seriously affected by Coalite competition. It must be said, however, that no reference was made during the visit to gas-fire competition.

The effect on the sale of coke for household purposes may be different. If, however, Coalite ever came to be generally used, it was understood that plants would be built in various parts of the country; and any surplus gas available bought and distributed by gas undertakings would tend to lessen the production of gas coke as such.

Speaking generally, the plant at the Barnsley works appears to have been well thought-out and designed; and assuming working and renewal charges are not abnormal, it may achieve the purpose the Company have in view.

The visitors received every courtesy from Major Hamilton and his technical staff, and all facilities were afforded for the inspection of the plant.

Increasing the Capacity of Meters.

Mr. E. J. Turley, of the Montreal Light, Heat, and Power Company, told the Canadian Gas Association at their last meeting that about fourteen years ago the Company concluded that the capacity of the then so-called three-light meter could be considerably increased without much extra expense by using the same size case, increasing the size of the valves, and adjusting the diaphragm to suit the enlarged valves. The valve finally adopted was slightly smaller than that in use in the standard ten-light meter. The diaphragm also had to be altered. It was found, contrary to expectation, that, though the valve had been doubled in size, the area of leather in the diaphragm had to be decreased about 15 p.ct. This alteration was effected by making the width of the diaphragm 3 in. instead of 3½ in.; the diameter of the disc remaining the same. It was necessary to increase the size of the flag-arms, cranks, motion work, and passages in the same proportion as the valves; the result being that the wear on the different moving parts is no more than in the smaller type. At present the Company have about 60,000 of this type of meter in use, and about 50,000 of the smaller type; and the percentage of bad leathers in the small-valve type is very much higher than in the large-valve type. They believe this is accounted for by the fact that, with the small-type valve, the leather continually rubs against the inside of the case, and develops hard spots; whereas in the increased-capacity meters with the larger valve, the diaphragm, being smaller, does not touch the tin, and does not develop hard spots, which are the cause of the biggest percentage of defective leathers. Careful tests show that, if the valves are properly set, the oscillation is about the same on the large valve as on the smaller one. The use of the large-valve meter does away with a great number of complaints where the pressure is low, owing to the fact that the drop in pressure through the meter is lower for the same quantity of gas consumed. The three-light case with large valve is no more expensive to maintain and repair than the old type of three-light, and is much cheaper to repair than a five or ten light meter.

INSTITUTION OF GAS ENGINEERS.

Committee Members and Representatives.

At a Meeting of the Council of the Institution of Gas Engineers which was held on the 12th inst., the following Committees and Representatives were appointed.

Emergency Committee.—Messrs. A. E. Broadberry, Sir Dugald Clerk, Samuel Glover, Thomas Goulden, Thomas Hardie, W. E. Price, J. D. Smith, and Samuel Tagg.

Finance Committee.—Messrs. Charles F. Botley, A. E. Broadberry, S. Glover, Thos. Goulden, Thos. Hardie, E. H. Hudson, S. H. Jones, J. Paterson, W. E. Price, J. D. Smith, S. Tagg, and J. W. Whimster.

Gas Investigation Committee.—Messrs. H. E. Bloor,* John Bond,* J. H. Brearley,* A. E. Broadberry, Chas. Carpenter, Sir Dugald Clerk, J. W. Cobb,* J. B. Cohen*, H. G. Colman, C. Dru Drury, E. V. Evans, W. Doig Gibb, S. Glover, Thomas Glover,* Thos. Goulden, Thos. Hardie, D. H. Helps, L. Hislop, W. E. Price, T. F. E. Rhead, J. D. Smith, A. Smithells,* S. Tagg, F. P. Tarratt, G. R. Thompson,* and Chas. Wood. Research Chemists: J. W. Wood and Albert Parker.

Life of Gas-Meters Research Committee.—Messrs. John Bond, A. E. Broadberry, R. E. Gibson, S. Glover, F. W. Goodenough, T. Goulden, T. Hardie, P. S. Hoyte, A. A. Johnston, W. E. Price, J. D. Smith, Albert Stokes, and S. Tagg. Chemist: J. G. Taplay.

Refractory Materials Research.—Chairman: A. E. Broadberry.† Messrs. J. F. Bell, John W. Cobb, H. G. Colman, S. Glover, Thos. Goulden, Thos. Hardie,† J. A. Harker, S. H. Jones, J. P. Leather,† F. Prentice, W. E. Price,† H. E. Riley, J. Wilkinson.

British Refractories Research Association Council.—Messrs. A. E. Broadberry and W. E. Price.

National Gas Council Executive Board.—Messrs. Thomas Goulden, Thos. Hardie, J. D. Smith, and Samuel Tagg.

British Commercial Gas Association.—First Vice-President: Mr. T. Hardie. Vice-President nominated by the Institution: Mr. J. Ferguson Bell.

Corbet Woodall Scholarship Advisory Committee.—Messrs. John Bond, Charles Carpenter, W. T. Dunn, Thos. Hardie, W. E. Price, Charles Wood, and Henry Woodall, Jun.

British Engineering Standards Association, Sectional Committee on Machine Parts, their Gauging and Nomenclature.—Mr. Alexander Wilson (Leven).

Conjoint Board of Scientific Societies.—Mr. Thos. Hardie.

British Engineering Standards Association, Representatives on Sectional Committee on Pipe Flanges.—Messrs. Charles Carpenter and Thos. Hardie.

British Engineering Standards Association, Sectional Committee on Pipe Threads.—Mr. Alexander Wilson.

Advisory Committee on the Livesey Professorship of Coal Gas and Fuel Industries at Leeds University.—Messrs. John Bond, J. H. Brearley, Charles Carpenter, W. Doig Gibb, S. Glover, Thomas Glover, Thomas Goulden, Charles Hunt, Thomas Hardie, and Charles Wood.

THE SCIENTIFIC INVESTIGATION OF COAL.

By Prof. John W. Cobb, C.B.E., B.Sc., F.I.C.

Address delivered to the Yorkshire Junior Association on Oct. 22 in the Lecture Room of the Fuel Department of the Leeds University.

It might have seemed proper for me to speak before you at length on some particular subject we had been investigating; but, in agreement with Mr. Roper (who conveyed to me your invitation to address you), I came to the conclusion that it might be more interesting to you if I were to leave aside to some extent on this occasion the detail of your daily work, and discuss something of a more general character, with a direct bearing upon your industry, but free from the detail which necessarily attaches to the complete account of any particular scientific investigation. This is the more justifiable, because accounts of the work which we have been doing during the past year of special interest to the gas industry were given to the meeting of the Institution of Gas Engineers in London, and are published in the current numbers of the Technical Press, where you can go into them at your leisure.

What I propose to do to-day, and what I hope will be of interest, will be to place before you as well as I can in the time available a very general account of the various methods which can be employed for investigating the constitution of coal scientifically, and arriving at some understanding of how this constitution may be connected-up with the results of carbonization. I shall not be so much concerned with results as with the methods employed in attaining such results.

Supposing one begins to study the substance called coal, with which we are mainly concerned for the making of gas, coke, and bye-products, there are various possible ways of examining it in order to determine its physical structure and chemical constitution, and their bearing on the properties which are of importance for technical purposes. Most of these methods have been now more or less applied. The first method is that of microscopic examination. It is not easily applied on account of the soft and brittle nature of coal. You may know that rocks are examined by grinding-down on a zinc plate with emery powder and water until you get a section so thin that it can be examined under the microscope by transmitted light, and its appearance studied. This has been done with coal; but it is not at all easy for an amateur with so friable a material. It has been done successfully by a few people who have studied and practised the technique, and particularly by Mr. Lomax, at St. Helens. Even without microscopic examination, however, it is often possible to pick-out portions of the coal which obviously differ in brightness and general appearance; and these have been found to possess different and characteristic properties. There is, too, another method of microscopic examination in which you do not attempt to get a thin transparent section, but one flat, polished face. Very little has been done in this way for coal, but with metals it is the method which is almost solely employed. One face is ground and made as smooth as possible (free from scratches), and the smooth face is subjected to microscopic examination by reflected light. It may receive a preliminary etching by a reagent which acts more on one constituent than another. Not much, as I said, has been done in this way with coal or coke; but this does not mean that the method is hopeless. It has been tried with such etching reagents as pyridine and pyridine vapour.

These are preliminary methods. Then, in order to get more definite chemical information, there is the method of preferential solution. Supposing you had a mixture of brickdust and common salt. However intimate the mixture might be, if you treated it with water you would separate it into two parts—one part containing the soluble salt, the other the insoluble brickdust. An attempt has been made to separate coal into constituents which had different solubilities in the reagents employed, and numerous reagents have been employed. The difficulty which is met in applying this method is that all the milder solvents such as benzene and ether dissolve so little of the coal substance that the temptation has always been before the investigator to strengthen the solvent and increase its attacking power. Investigators have, therefore, gone on from the use of a solvent like benzene or ether to stronger solvents like pyridine and phenol, and even for certain purposes to the use of alkali. In this way, supposing we take pyridine, by acting on finely-ground coal we can effect a separation into two portions—one soluble in pyridine, and the other insoluble, with different properties. This method may be said to have been quite useful up to a point; but it is to be borne in mind that if the material (coal) is such that strong chemical reagents have to be employed before much differential action can be brought about, we are always faced with the danger that it may not be pure differential solution, but the reason of the attack may be that actual decomposition of the coal has been effected by the reagent. This is probably the case with pyridine, which has been widely used. This does not condemn the method if, in examining the extract and the residue afterwards, we do not make the assumption that we are dealing with unchanged materials. It may still be possible to make quite useful deductions. On the whole, however, this method of investigation has been rather disappointing.

Another method (and one with which you are very much concerned) is the gradual decomposition of the coal by the application of heat. The mode of the decomposition is bound-up with the nature of the original substance; and this decomposition by heat is what occurs in the process of carbonization; but it is very difficult to draw any definite conclusions as to the original molecular arrangements of the coal substance from the results obtained in large-scale carbonization, because there the process is deliberately given a violent character. It is intended to bring about quickly decomposition of a far-reaching character. You begin with coal, and drawing off gas and tar you finish with coke, which is nearly all carbon and ash—the decomposition having been carried as far as possible in one operation. Supposing, however, that carbonization were to be conducted with the object of obtaining information as to the original constitution of the coal, the plan would be based upon the principle of giving a gradually increasing thermal shock to the system which should induce a separation of groups from the coal substance by stages. The most loosely attached groups would come away first; and by studying the nature of the detached groups and the order of their detachment, some idea might be formed of the original architecture of the coal substance.

In order to do this satisfactorily, there are several conditions which would have to be satisfied. In the first place, the temperature rise must be slow, and the decomposition which occurs at any one temperature should be completed before this temperature is exceeded. Time should be so given for all products of decomposition at any temperature to be distilled away (so far as they will distil) before the temperature rises further. There should be no superheating. Every constituent must be allowed to boil-over at its proper boiling-point. If this were not done, any product of decomposition before it had time to distil-over would be subjected to a higher temperature which might decompose it and bring about its loss from this point of view. Carbonization which takes place in accordance with the condition just specified differs very widely from ordinary carbonization in the works.

In cases where any attempt has been made to follow such a plan, the carbonization of even a small quantity of substance in

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the laboratory has occupied many weeks; while the ordinary technical carbonization process only occupies some hours, or at the most one or two days. This carbonization without superheating—completing the decomposition and distillation at one temperature before proceeding to a higher temperature—requires thorough examination. It has been done up to a point in the laboratory by Prof. Wheeler and his collaborators, and by other people; but it wants doing on a very much larger scale than hitherto. Something is wanted intermediate in scale between the laboratory and the full works' plant, where a considerable amount of material can be distilled under precise control and the primary products of decomposition collected and examined for each stage. For some purposes, the examination of a few grammes in the laboratory is quite good; but, on the other hand, for many technical purposes it is quite inadequate, because some of the substances with which we may be particularly concerned are only produced in quite small quantity. If we consider a substance like toluene, for instance, the quantity produced in the tar from a few grammes of coal is very minute; the same with benzene. One is apt to forget what a really very small amount it is compared with the amount of coal carbonized. Supposing the tar contains 1 p.ct. of toluene, which is quite good, and the tar is itself only 5 p.ct. of the coal carbonized, then it is obvious that the toluene is a very small percentage indeed of the coal which is originally carbonized; and other interesting substances occur in even smaller quantity than that. If, therefore, an attempt is to be made to study the carbonization process thoroughly in the way that I have suggested without superheating, and if the results are going to be a guide not only with reference to a main product like coke or gas, but to be of value in determining in detail the nature and value of the tar produced, it is plain that something more than the laboratory scale of operations is going to be necessary in order to obtain such quantities of these materials as will allow of a useful technical examination.

There is another way in which some conclusions can be drawn without subjecting the coal to this particular form of carbonization, and that is to take successive quantities of coal and bring them up in turn very quickly—as far as possible, immediately—to some particular temperature (the temperature taken being gradually higher and higher), collecting the products for examination, and noting what the differences appear in their composition and nature as the temperature is raised. This sounds rather complicated; but I will explain. Supposing we take a sample of coal and heat it to 400° C. as quickly as possible, collecting the products and examining them. Now we take another portion of the sample and bring it up to 600° C., again collecting the products, and the same with other portions at 800° and 1000° C. By a comparison of the results obtained at one temperature and another, some useful information can be derived, although there is no pretence here of having obtained the primary products of decomposition as they would be obtained by the preceding method which I have described.

This method of investigation is one which has been more followed than any other, both on the laboratory and works scale. When conducting the carbonization as far as possible at any one temperature, the products will be a mixture of primary products at that temperature, surviving primary products from lower temperatures, and secondary products from all the decomposed primaries. It is difficult to draw conclusions from a result so complicated, but something can be done. For instance, supposing that you found that the evolution of hydrogen strongly increased at a certain temperature, you might associate that with the presence of some constituent in the coal which decomposed at that temperature. This has, as a matter of fact, been done; and it is claimed that a constituent is present in coal with the chemical characteristic of this decomposition at 800° C. yielding large quantities of hydrogen.

You will understand that I have not attempted to treat any one of these methods in detail, but have, as it were, mapped-out the field, indicating the nature of the methods available. So far as regards the constitution of coal alone, the examination might end with the decomposition by heating which I have been describing, and the examination of the products which are formed as a direct and immediate consequence of decomposition. Technically, further study in research of at least equal importance is required, because in all the technical processes of carbonization there is a liability to secondary decompositions—that is, the products which are obtained finally in the gasholder or in the tar-wells are not the products as they would come away from coal which was very carefully distilled, without further secondary decomposition. If you take the case of a gas-retort or a coke-oven when the charge is being carbonized, the volatile products of carbonization are subjected to the decomposing influence of the red-hot coke and the fireclay walls of the retort or coke-oven; and for what it is worth, to the decomposing influence of the radiant heat.

These secondary decompositions are of the first order of importance. Supposing the coal in this country had all been distilled with no secondary decompositions, the benzene and toluene which are so important would only have been produced in very small quantity, because it is only to a very small extent that either benzene or toluene is present as a primary product of carbonization. These two substances, and most substances which form the basis of the colour industry, are only produced as a consequence of secondary decomposition; and therefore the examination of carbonization falls logically into two parts—the laws governing the formation of substances from the coal, and those determining the degree of after-decomposition—*i.e.*, the change from primary to secondary products of carbonization.

When you come to consider the number of combinations which are possible of different primary products, and of different temperatures and atmospheres to which they may be subjected in manufacturing processes, it is obvious that a large amount of work can be done usefully in following up these secondary decompositions. It is, moreover, work which lends itself particularly to laboratory methods of investigation. To explain what I mean, it may be permissible to refer to the study which was carried out here on the decomposition of benzene and toluene. By working with pure benzene, it was possible to determine when it began to decompose, and to prove how very far the nature and extent of the decomposition was determined by the atmosphere in which the benzene was being carried—to show, for instance, that the benzene in a mixture of nitrogen and benzene rich in the latter, was decomposed quite extensively at 800° C. (the normal gas-works carbonizing temperature), but that when a mixture of hydrogen and benzene was used, poor in the latter, practically no decomposition took place.

In another portion of that work which has not been published in detail, it was shown how very considerable quantities of benzene and toluene could be produced from cresylic acid. When one considers how far the tars obtained in low-temperature carbonization are characterized by the presence of phenols, cresols, and the like, we can see how plentiful a source of benzene can be drawn upon when these substances are subjected, as in gas-works and coke-oven practice, to higher temperatures and contact with red-hot coke.

It is impossible to say what the future may bring forth; but to my mind it is certain that the methods of dealing with coal tar will have to be very much expanded and developed. At present, when coal tars have been obtained, manufacturing operations are almost solely directed to their distillation with a certain amount of low-temperature chemical purification. As the fuel-using processes of the country become more complex, the temperatures and other conditions of carbonization and gasification will be more varied. The tars will be more varied in composition to a corresponding degree, and probably in the future the scientific tar-distiller will have to arrange his works so that the process of distillation is preceded by one of suitable thermal treatment. The right temperature and conditions generally will lead as the first step in his operations to the production of a tar which will yield on distillation the greatest amount of valuable products. He will control the composition of his tar before distilling it. How far this will be done it is, of course, impossible to say; but that it will be done to some extent I have no doubt. This is, however, something of a digression.

Another possible method of arriving at information as regards the nature of the original coal substances and the processes of carbonization, depends upon the fact that different decompositions are accompanied by different thermal phenomena. Some decompositions took place with the evolution of heat, and some with the absorption of heat; and it is possible to obtain some information as to the course of a complex reaction like that of carbonization by study from the purely thermal standpoint. Thus, when cellulose is heated, it decomposes at a temperature of 285° C., quite definitely at one temperature with an evolution of a very considerable quantity of heat; so that if the temperature of cellulose is raised gradually, when you get to a certain point you find a considerable evolution of heat occurring, as disclosed by the plotted heating curve. Now cellulose is one of the substances which entered into the constitution of the vegetation from which coal was formed. If unaltered cellulose were present in any quantity in coal, when you came to the same temperature on heating coal, you would expect the same kind of heat evolution. The actual heating curve obtained shows that there is practically no unaltered cellulose in coal.

I think that you will agree with me, after listening to this brief and imperfect account, that an enormous field of work is open for investigators of different talents, and different mental and material equipment, in adding to the accumulation of knowledge and understanding which is necessary to the development of the subject with which you are concerned and the advancement of the profession in which you are engaged.

Finally, I may say that I have deliberately omitted references to names and titles of papers in putting this address before you, because their number would have tended to overloading and confusion.

Chicago New Gas Plant.—The new $18,000,000 gas and coke plant built for the use of the People's Gas Light and Coke Company at Chicago, covers, with its adjuncts, about 250 acres of ground, and has some 12 miles of railroad track. The coal-gas plant will carbonize about 2000 tons of coal a day, producing 12,500,000 c.ft. of gas and 1200 tons of coke; while the water-gas plant will generate some 20,000,000 c.ft. of gas daily. Storage facilities are provided for 240,000 tons of coking coal, or 120 days' supply, as well as 30,000 to 35,000 tons of coke from the coal-gas plant for the production of water gas. The People's Gas Company will take all the gas and the coke output of the plant. For connecting the plant with the distributing system of the Company, it has been necessary to construct a tunnel under two canals, to take the 36-in. mains; the tunnel being 9 ft. diameter, 1700 ft. long, and 88 ft. below the surface of the ground.

SCOTTISH JUNIOR GAS ASSOCIATION.

Opening Meeting of the Western District.

There was a record attendance in the Royal Technical College, Glasgow, on Saturday, the 15th inst., at the inaugural meeting for the new session of the Western District of the Scottish Junior Gas Association. Mr. James Jamieson, Edinburgh, the retiring President, occupied the chair at the outset; and after expressing his great pleasure at seeing such a splendid attendance of members, he introduced Mr. James Cubie, of the Gas Department, John Street, Glasgow, as President for the year.

The President thanked Mr. Jamieson for the kindly way in which he had introduced him to the presidential chair. He was also grateful to the members for the honour they had conferred on him and the hearty response they had given to Mr. Jamieson's remarks regarding his work as Secretary of the Association. On their behalf he was sure he might congratulate Mr. Jamieson on his appointment as Assistant General Manager of the Edinburgh Gas Department, and hoped it would be a stepping-stone to a higher position in the gas industry. So far as their branch of the Association was concerned, they had been fortunate in securing the services of Mr. Alex. B. Munro, of the Gas Department, Milan Street, Glasgow, as Secretary. Regarding the work for the coming session, he was able to announce that the Council had agreed that the first half hour of each meeting would be devoted to a discussion of the paper read the previous month. They would be glad to have remarks from members whether given extempore or read from papers after preparation. It was felt by the Council that this innovation would go a long way towards stimulating interest in future meetings of the Association. It was a personal gratification to himself to note that with the commencement of the new session they had broken all records in regard to nomination and election of new members. No fewer than 66 new members had been nominated that night and elected.

The President then read his opening address to the members, the text of which was given in last week's issue of the "Journal," p. 246.

Mr. J. Jamieson (Edinburgh) said he had been asked by the President to say that he would welcome criticism and discussion of his remarks. If there were points in the address with which the members did not agree, then they had the permission of the President to tear the entire contribution to pieces if they felt so disposed.

Mr. W. M. Paterson (Glasgow) said the address with which Mr. Cubie had presented them on this occasion simply teemed with a mass of detail and most valuable information. He particularly thought that the idea which had been proposed, of having informal discussions and meetings, was on the right lines to stimulate interest and enthusiasm. He could recall the meeting which was held in the workshops at Milan Street, Glasgow, last session, when Mr. John M'Isaac, of the Gas-Furnace Department, read a paper on "Gas Furnaces, their Recommendations, Fixing, and Adjustment." Although many of the members attended the meeting knowing little or nothing about the subject, they saw so many striking things around them that he was sure almost anyone present could have spent a profitable half-hour in simply asking and getting questions answered to his own personal satisfaction. A meeting such as the one he was referring to was bound to be helpful and informative to members. In the course of his address, it would be observed that Mr. Cubie touched very interestingly on the subject of membership qualification. He was glad the President had mentioned this matter, because it had got to be decided very soon. It seemed to him that the fixing of a qualification for membership in the Junior Associations would be rather lowering than elevating the standard of education. His viewpoint was that if they induced a man to enrol in the membership of the Junior Associations, they encouraged him in the first step towards seeking to better his education. Then the President had diverted their thoughts to an important theme—namely, that of coal mines being acquired and owned by municipal authorities. Hitherto, there had been a feeling that coal tests carried on at the various gas-works throughout the country were not as successful as they might be. In the Tradeston Gas-Works, Glasgow, for instance, something like fifty different classes of coal came in, and a coal test, under such abnormal conditions—no matter how carefully it was carried out—could never be particularly satisfactory or helpful. True, they got results; but with so many different coalowners supplying the works with fuel, they could not possibly have much reliable data to go upon. What he did feel about the coal question was that the municipal authorities throughout the country ought to get a sufficient number of coal mines entirely under their own control so as to enable them to be guaranteed all the coal of a suitable type that they required. There was always, of necessity, a bigger demand for coal in the winter months; and he did not anticipate at this season of the year the municipal authorities would have any difficulty in disposing of their stocks of coal. The situation might be a little different in the summer season; but if the stocks could not be disposed of elsewhere, then they could be placed in store to await the busy winter months, when the demand was increased.

Mr. John M'Isaac (Glasgow) regarded the President's address in the light of a reasoned stocktaking—a retrospect of the past with a careful review of the present and a peep into the future. He commended the suggestion that had been made for "lecturettes" or informal meetings. To his mind, the word "lecturette" was to be preferred to the phrase "informal meeting." It seemed to him that something along the following lines could be adopted. If a country member was presented with a difficulty or a problem, could it not be arranged that, instead of waiting for a general meeting of the Association, he should communicate the terms of his difficulty to the Council? The latter in their turn could then arrange for someone to give a lecturette at which country members in the vicinity of the one who had made the particular inquiry could be invited to be present. Speaking for himself as one who had some knowledge of gas for industrial use, he might say he had been able to stop people introducing electric light simply because he was in a position to show them that gas was the correct fuel for them. This was the only thing those who were interested in the gas industry could do.

Mr. A. H. Whitelaw (Glasgow) remarked that in the City of Glasgow between 75 and 80 p.ct. of the ratepayers had their houses fitted with gas. It struck him, then, that what they ought to aim at was to keep the lighting they had got. Nowadays, they had to face the fact that a man who was building a house would never think of installing gas if he could get electric light. They had to face this fact; and their endeavour ought to be to make sure that they kept the proportion of gas lighting they still had. Practically all the complaints about bad gas arose from defective burners. He agreed that the public still needed a considerable amount of education on the matter of burners; and if gas departments went in for propaganda on these lines, they would find it most advantageous.

Mr. S. H. Hunter (Milan Street, Glasgow) was sure all who attended the meeting felt inclined to give the President a pat on the back for his carefully-reasoned, thoughtful, and exhaustive address. Criticism had been invited on the paper; but he felt there would be little forthcoming. The most that could be said would be in the direction of general all-round agreement with the views expressed by the President. It did appear to him that the great need of the industry to-day was for improved maintenance in domestic lighting and heating apparatus, and in the field of industrial operations. The necessity for this had been repeatedly emphasized in the City of Glasgow. People came forward with complaints about bad gas, and they never seemed to want to be bothered with anything in the shape of an explanation. Somehow or other, these people had developed the idea that the gas which was being supplied was at the root of the whole trouble.

Mr. A. Wylie (John Street, Glasgow) said the address they had just listened to was a most welcome one, since it struck a new line of thought on many points. He approved whole-heartedly of the suggestions Mr. Cubie had put forward in regard to informal meetings. So far those taking part in the discussion had largely confined themselves to questions affecting maintenance; but there was one matter regarding coal mines upon which he was desirous of saying a word or two. To the average miner, the nationalization of coal mines was an idealism. In spite of all the arguments that would be adduced against nationalization, the miner of to-day still clung tenaciously to his ideal, and looked forward to when it would become an accomplished fact. To some extent, they must feel sympathy with the miner, because of the conditions under which he laboured. If, then, they could get the miners to agree that the municipalization of mines was a step in the direction towards the realization of the goal they had in view, something useful might be accomplished.

Mr. John Macintyre (Glasgow) ventured the suggestion that additional legislation should receive the imprimatur of Parliament giving municipal authorities power to purchase coal compulsorily if the mining industry, because of a strike or a lock-out, were deliberately holding the fuel up.

Other members took part in the discussion, but no point of outstanding interest emerged.

Mr. Cubie, who was cordially thanked for his address, briefly replied to the discussion, and the proceedings terminated.

North of England Gas Managers' Association Auxiliary Meeting.—Arrangements have been made for the fifth half-yearly auxiliary meeting of the North of England Gas Managers' Association to be held in the gas-cookery lecture room, Tubwell Row, Darlington, at 2 p.m., on Saturday next, Oct. 29, when the chair will be taken by Mr. A. E. Ruffhead, who will deliver an address. There will afterwards be an inspection of the Gas Department showroom of the Darlington Corporation, and a visit to the gas-works, where tea will be provided.

Manchester District Institution of Gas Engineers.—The quarterly meeting of the Institution is to be held at Preston on Friday of this week, the 28th inst., under the presidency of Mr. Samuel Tagg. The members are invited by the Directors of the Preston Gas Company to inspect the Moor Lane gas-works, and afterwards to partake of luncheon at the Bull and Royal Hotel. At the business meeting in the afternoon, Mr. Frank H. Robinson, of Harrogate, will open a discussion on the "Gasification of Coal in Relation to the Sale of Gas on the Thermal Basis."

Consumption Per Head in the United States.—It will be recalled that in the "Journal" dated Aug. 31 last, there appeared [p. 481] an editorial article, in which were calculated out, in connection with the lately completed census, various figures relating to the gas consumption. In this article it was pointed out that dividing the 228,537,998,000 c.ft. total gas consumption by the 47,157,749 population of the United Kingdom, gave a *per capita* consumption of 4846 c.ft. of gas. Reproducing these figures, the Editor of the "Gas Age-Record" says that consumption of gas *per capita* of the population is an indication of saturation that is instructive; and he proceeds to compare the "Journal" figures with those relating to the United States. The census dealing with the year 1919 credited the United States with a population of 105,710,620. The same source states that gas undertakings sold 307,903,000,000 c.ft. of gas, and that 271,102,298,000 c.ft. of natural gas were used for domestic purposes—a total of 579,015,298,000 c.ft. Dividing the population into this quantity gives 5477 c.ft. *per capita*. This, he remarks, is a higher figure than the saturation figure for Great Britain and Ireland, which is rather surprising, considering the greater area and population in the United States which are out of contact with mains.

MIDLAND JUNIOR GAS ASSOCIATION.

General Meeting.

A Meeting—the first this session—of the Midland Junior Gas Association was held on Thursday last, at the Council House, Birmingham, at which there was a full attendance of members. Mr. W. J. Pickering (the retiring President) occupied the chair at the outset.

Induction of the New President.

The President, in asking Mr. William Batt (the new President), of the Gas Distribution Offices, Newcastle-on-Tyne, to take the chair, pointed out that Mr. Batt had been a member of the Association from its early days. He had throughout taken an active and sustained interest in the affairs of the Association. Although he was now resident far from Birmingham, he confidently believed Mr. Batt would prove a worthy President, and uphold the traditions of the Association.

Amid applause Mr. Batt took the chair.

The President then moved a vote of thanks to the retiring President (Mr. Pickering) for his loyal and devoted services. He had been a member of the Association from its commencement, and no one had worked harder on behalf of the Association than Mr. Pickering. They recalled with gratitude his work as Hon. Secretary over a period of seven years.

The resolution was seconded by Mr. C. F. W. Rendle (the Senior Vice-President), and carried with enthusiasm.

Mr. Pickering, in reply, said that anything he had done for the Association had been a labour of love. He should continue to take an active interest in the Association's work. He appealed to the members for their co-operation, so that the success of the ensuing session might be assured.

The President then delivered the following

INAUGURAL ADDRESS.

The gas industry should be proud of the progress it has made during recent years; and if business is to be further increased and maintained, it must be conducted on still keener commercial lines. In my opinion, we have nothing to fear from competition so long as we give our consumers the good service which the present day demands. Even to-day there are still some gas undertakings content to carry on their business on the lines of "what was good enough thirty years ago is good enough to-day." With its one thousand and one uses, gas has many advantages over any of our competitors for domestic, heating, and industrial purposes; so that there should be little difficulty in persuading the consumers to extend more fully its employment by means of properly-trained and practical salesmen.

In Newcastle-on-Tyne the sales department is under the direction of the Secretary and Commercial Manager, and so organized that it and the distribution department work in perfect accord with each other, to the mutual interests of the Company and its consumers. Their methods and dealings with the consumer are uniform as far as is possible to obtain. Even with the efficient salesmen and district inspectors, the gas industry as a whole cannot, and will not, continue to prosper to the full extent, with the many advantages offered, without the full co-operation of labour; and by that I include the plumber of the north and the gas-fitter of the midlands and south country.

The time has now arrived when, in order to secure increased sales of gas apparatus or number of consumers, an end should be put to the constant state of agitation and unrest that has prevailed during the last two or three years; and there should be greater co-operation between capital and labour. There prevails to-day that artificially restricted output of the individual (which I feel certain is now improving), the unwillingness of the worker to put into his work the necessary energy, as it is labour's opinion that the greater the energy the more money and profit are raised by the employer; and, again, that by individual increased production on the part of labour, a greater number of workpeople will join the already long lines of unemployed. This does not refer to particular sections of any trade; but it is general throughout the whole of the country. It is a fallacy on the part of labour; and it is only necessary to compare the charts of work done and the charts of costs to see why so much work—or, as we term it, so many "jobs"—are turned-down or held over until the day when a more reasonable return of labour is obtained for capital. These fallacies have taken a hold on our industries, and brought about to some extent slack times and unemployment, which in many instances is erroneously attributed to over-production.

Two essentials are absolutely required—one from labour, the abandonment of restriction of output; the other from capital, to encourage honest work with improved efficiency and organization. Employers should consider that to-day labour must be recognized, and that every consideration must be given to produce better and healthier working conditions; also, by instituting social recreation, to bring together the workers during their leisure hours, where men, foremen, and managers can meet and discuss fully the conditions of labour, and suggestions for carrying it out. Football, cricket, and other forms of sport organized to keep them healthy and happy in their work are suggestions in the right direction.

We of the gas industry are directly connected with the building trade, and all agree that there is a shortage of houses, which, so long as this lasts, is against working men living happy and healthy lives and giving of their best to produce good work. It is therefore in the interests of our working men that they should be provided with healthy homes as quickly as possible. There need be no fear for many years of any shortage of work. The prosperity of the country in the long run is the prosperity of each individual in it; and the difficulty to overcome is the individual restriction of labour. The efficient workman concludes that if the employer can pay high wages to inefficient workmen, there is no reason why the good workmen should do more.

While individuals may reap an advantage for the time being by exploiting their unjustifiable opportunities and demands, it will sooner or later be turned completely against them by the public, by self-denial or the adoption of substitutes. Evidence of this has recently been provided by the action of the last coal strike, which very materially affected the gas industry by restricting supplies and, again, indirectly affecting those engaged or allied to us. These restrictions are only of a temporary nature, and the gas industry is again regaining normal conditions, and sooner or later the time will come for the full service of the men. It is the duty of a gas undertaking to place itself in a position that will enable it to meet the demands which may reasonably be expected and hoped for in the near future. Unless this is done now, it will be faced with a scarcity of efficient labour, and disastrous results will follow.

While considering the labour question, the fact must not be overlooked that the management and staff should control the work on a system of efficient scientific methods, combining firmness with tact and consideration to obtain the best results. In addition to this, provision must be made so that the worker has the advantage of up-to-date and labour-saving tools and machinery, as without these he cannot be expected to produce his best at the minimum of cost.

In the case of distribution, the hub of the department is the stores, through which all materials pass on their way to and from work in hand. The bulk of materials returned from the district finds its way into various collecting bins, to be eventually sold as scrap. With economy in view, these scrap heaps are of unknown value. Whereas in the days of cheap goods only sufficient time was spent to classify them roughly, now it behoves one carefully to examine every piece that comes in, with consideration as to its usefulness or possible conversion for any purpose whatever. For instance, my Company have for some considerable time had what is termed a recovery department, where all brasswork—such as pendants, brackets, stopcocks, &c.—are examined and put into useful condition, where possible, by the brassfinishers. These articles when dealt with are practically as good as new; and the cost of repair shows a considerable saving, and quite justifies the employment of such labour. This does not comprise the whole of our efforts in this direction, but is merely stated to illustrate the point. For instance, there is the reclaiming of cooker tins by the retinning process, the renewal of plated parts, welding, and even (a thing one would term of no importance) the skimming from the cooker cleaning tanks of fats, which are collected and sold to soap manufacturers. In fact, it is advisable to be always on the alert for the possibilities of the utilization of what at one time was considered of no importance.

At present, the great object is to reduce prices as much and as quickly as possible; and we find salesmen again making their regular calls, thus indicating that competition has commenced for work offered at keen prices. This in some cases makes it impossible to have a margin of reasonable profit should proper material and good workmanship be employed in the carrying-out of the work. There is, unfortunately, a tendency on the part of some gas undertakings not to consider closely the quality of the material offered, but more particularly to look at the first cost—ignoring the fact that no firm of good repute will condescend to turn-out poor material at a cut-price for the sake of securing an order. The adoption of inferior material and workmanship would mean that, in the long run, the work—although at a somewhat lower initial cost, and in many cases high increased maintenance costs—would have to be replaced earlier than it should have necessitated; and the consequence is a troublesome and expensive job.

EDUCATION.

Education is receiving greater consideration and thought than at any previous period; and it is very distressing that so many of our present-day boys, whose education has in many cases been provided for them by self-denial on the part of their parents, should commence their working life by the inducement of high initial wages and later swell the roll of the over-produced unskilled workman with often unemployment and a severe struggle for an existence! Our industry to-day occupies a position of great strength; and the future depends to a very large extent upon us juniors. I firmly believe that indentured apprenticeship should be enforced by all employers, and facilities granted so that each will receive a thorough technical training of a practical and theoretical nature. This training should not be wholly carried out by evening study after working throughout the daytime in the workshops. But I do consider that evening study is essential to a certain degree. Many a youth in the gas industry is ignorant of the subjects he should pursue for study, and seeks advice of his chief, who invariably turns to one or more of the subjects, such as gas engineering, supply, or gas-fitting, not knowing of any special preparatory course to take before entering one of the classes named. As a teacher for several years at technical schools I have had personal experience of this; and it is to be

regretted that the young men have not received proper direction. We, as juniors, will, I hope, when the time arrives, be able and willing to give advice to the boys who are now following in our footsteps.

The Junior Gas Associations have during recent years done very much in the interest for the advancement of education; and we must endeavour to continue the good work. There does not appear to be any definite scheme or programme of education for these young men who rightly have the ambition to some day attain a position of trust and responsibility. Their whole future depends on education; and there is greater need for further and immediate organization, which will continually benefit the industry. I am pleased to say that the National Gas Council have this under consideration—due largely to the persistence of the Junior Associations. The Newcastle and Gateshead Gas Company have always encouraged their younger employees to improve their education by paying the fees should a certain percentage of attendance at classes be made, and by the presentation of prizes for success in the examinations.

Several engineering firms on the Tyne, who must for several years have greatly benefited by the study of education and proper training of their boys, have adopted the system of compelling them to attend classes and take subjects chosen by the firm. Prizes and scholarships are granted for proficiency; and as the successful students advance, they are passed into the University, from which many have gained high degrees. The time taken for these courses of study is willingly granted by the firms, who pay all expenses incurred, together with their usual workshop rate of pay. These youths are chiefly the sons of working men who, without this privilege, could not afford to attend classes, or later become men holding high positions in the engineering world, instead of having to remain as workmen. This education scheme, for which the engineering firms deserve every credit—and thanks are due to them—I firmly believe would likewise apply to the interests of the gas industry if extended to each and every one of our juniors, irrespective of their financial status.

I am firmly of the opinion that the syllabus set out for the Junior Gas Class is too much for a session's work. We have to keep in mind that these youths have recently left school, and are not familiar with the lecture system of teaching, and are incapable of quickly grasping a subject delivered by this means, especially when the lecturer sets his pace at a rate necessary to enable him to complete his subject in the usual short time allotted, as though he was in front of the more advanced University student. The teacher should thoroughly explain, in simple language, every specific part of the subject, accompanied by notes and diagrams on the blackboard, and, if necessary, repeat salient points until thoroughly understood by the class, even should only a small portion of the course be covered. He should even indicate where notes are to be made; otherwise the students are inclined to trust to memory and text-books, and often leave without a memorandum. It is to the interest of each individual to understand the lesson thoroughly; and it is useless for lecturers to deliver a paper quickly which leaves the student cold and probably no wiser in the end, resulting in discontent all round, loss of interest, and eventually failure at the examination.

I am of the opinion that the practical and oral examinations in gas-fitting, which have been adopted in recent years, together with the theoretical examination, have been of greater intrinsic value than those of theory only, which in many cases are of little value, judging from the ability of a student, as it is quite possible for those not in the profession to pass with honours. All such examination results should be endorsed and certified by the student's chief that he is a fit and proper person to obtain such credentials.

The education of the gas-fitter has during recent years greatly extended, and is receiving more attention universally. In many places gas-fitting was regarded as comparatively unimportant work, and often a branch line of the plumbers. Now is the day for specialization. This applies to all gas undertakings of any pretensions whatever; and even in the section of gas supply, which covers such a wide field of work, the organization of the department makes it imperative to further specialize in its various and subsidiary branches, because, as the years advance, gas supply becomes more and more complex and scientific.

In bringing this address to a close, although Birmingham is a long way from Newcastle, I have permission to welcome any of our members who would undertake the journey to inspect our distribution system; and I have no doubt they would find many points of interest to them.

The Chairman, in proposing a vote of thanks to Mr. Batt, commented upon the high standard of the address. He was specially interested in the observations made on the subject of education; and he, and many others, were hopeful that the National Gas Council would "get a move on" with a definite scheme for those engaged in the different sections of the industry. The sooner this was started, the better it would be for the rank-and-file who some day hoped to occupy responsible positions.

Mr. R. G. Marsh, who seconded the resolution, said he fully agreed as to the necessity for greater production per individual. His belief was that this question of increased production would have the most potent influence in the solution of labour questions. He (Mr. Marsh) detailed the Birmingham Gas Department's instructional scheme for gas-fitters' assistants, and pointed out that, when a youth commenced in the Fittings Department, the department immediately took an interest in the youth's technical training. Until a youth was 16 years of age, he attended a day continuation school for one day a week, for which the department paid him his ordinary day's wages *plus* his tram fares. The time that the youth thus spent in school was 8½ hours per week. The student was taught English, civics, mathematics, geometry, workshop science, drawing, and handcraft. A series of evening technical classes was held from September to March each year; and, like the day continuation schools, the attendance at these classes was compulsory—it being a condition of the assistant's employment that he attended regularly. The teachers at the latter classes were technical officers from the Fittings Department. When a youth left the day continuation schools at the age of 16 years, he was automatically transferred to the evening classes course. The following was a summary of the classes the students attended according to their age: Grade I., first year (16 to 17), workshop science and drawing; second year (17 to 18), lectures and drawing; third year (18 to 19), lectures, drawing, and practical. Grade II., first year (19 to 20), students' first half-session, practical and lectures; second half-session, practical and drawing; second year (20 to 21), lectures and practical. When a youth attained the age of 21 years, he entered for the final grade in gas-fittings; and in this class he was eligible to sit for an examination by the City and Guilds of London Institute in "Gas Fitting." Prizes were offered by the Gas Department as an incentive.

Mr. C. F. W. Rendle (Redditch) urged the necessity for a greater output on the part of the workmen, and greater mental energy from the students. We should never get straight until an increased output per individual was secured. One was daily brought face to face with decreased output and increased wages; and anything that would conduce to a return to the old state of affairs would be most welcome. The importance of technical training in schools for the younger men could not be exaggerated.

Mr. George Ball (Birmingham) commented with satisfaction upon the great strides that had been made in regard to technical education in the gas industry. Forty years ago there were practically no facilities for obtaining the theoretical with the practical training.

Mr. B. J. Bell (Secretary) congratulated Mr. Batt upon the excellence of his contribution. The gas industry was, he said, going through a crisis—an inevitable result of war conditions. The greatest drawback to progress at the present time was that of high prices; but he hoped that things would be made easier by an alteration in regard to coal prices. They did not fear competition; but to a large extent they had now to fight with their hands tied. As to education, it was most desirable, he thought, that the employers should have a standard of employment; and in this way, the man who spent a long and arduous time in educational work would be recognized. Employers should guarantee that they would not employ men below that standard.

Mr. R. J. Rogers (Fittings Superintendent, Birmingham), who was unable to be present owing to an important engagement, wrote that he had had an opportunity of reading Mr. Batt's address, which he regarded as most interesting and thoughtful. Touching on the necessity for increased production on the part of labour, Mr. Rogers added: "In my opinion, it is absolutely necessary for every individual, whether employer or employee, to recognize the basic fact that, unless we obtain an increased output per individual, we shall not be able to maintain our position in the world's markets. It is high time that every thoughtful person appreciated that if restriction of output is continued, it will ultimately lead to national disaster. Every opportunity should be taken to impress these facts upon the workers; and I am now having prepared for display in the workshops under my control in this department, a notice as follows:

> The Real Solution—Increased Output per Individual.
>
> Not only has the manual worker to realize this important factor, but the employers [as is rightly pointed out by Mr. Batt] must do all in their power to expedite the output of work by the introduction of modern machinery, sound organization, and up-to-date methods. The gas industry is at the present time passing through a very critical stage, and like all other industries, it is incumbent upon every worker in the industry to do his utmost to follow on broad lines the injunction, 'Greater output per individual.'

Personally, I should like to see such a notice displayed on suitable notices in every workshop in the country. Men must be taught to think about it, and to realize that, notwithstanding the many other factors which are contributing to this world-wide unemployment, one of the greatest in the whole situation is to understand this important question of output and the necessity for the abolition of "ca' canny" methods."

Mr. L. H. Thomas (Birmingham) advocated co-partnership or bonus schemes to stimulate work. Good would result, he thought, where definite inducement was given.

Mr. G. T. Callaghan (Birmingham) said he greatly appreciated the facilities afforded in Birmingham for obtaining practical experience. Such a system was needed throughout the gas industry.

Mr. C. Carrington Barber (Saltley) warmly congratulated Mr. Batt upon his address. He hoped the Association would have a thoroughly successful season.

Mr. T. H. Poulson (Stafford) said "ca' canny" was a most serious menace to the whole of the industrial world. All would gladly welcome a return to the pre-war standard of a decent day's work for a decent day's pay. Until such conditions prevailed, and coal and other raw materials could be obtained at much lower prices than now, the gas industry would continue to suffer.

Mr. L. Sturdee (Birmingham) disliked the bonus system, because there was a tendency for it to lead to piecework.

A successful inaugural meeting then terminated.

The opening meeting of the new session of the London and Southern District Junior Gas Association will take place on Friday of this week, at the Westminster Technical Institute, when Mr. G. M. Gill, the Chief Engineer of the South Metropolitan Gas Company, will give a lecture (illustrated by lantern slides) entitled "Observations on Gas-Works Practice in America."

AMERICAN GAS ASSOCIATION.

Some Papers for the Annual Convention.

The American Gas Association will be holding their annual convention in Chicago during November. For the purpose of securing full attention for the communications to be submitted, various papers have already been circulated; and some points are taken from prints which have so far come to hand.

Selling Tar to Distillers.

Mr. R. P. Perry, of the Barrett Company, New York, asks "Why Should Gas Companies Sell their Tar to Distillers, instead of Working it Themselves?" His own reply to the question is that gas companies, as well as bye-product coke companies, have in the past received (and will do so in the future) the best return for their tar by selling it to large, well-organized, and well-equipped distillers. There may be exceptional instances in which a gas or coke-oven company may for a year or two, or perhaps in still more isolated cases for a series of years, get a higher return for their tar by working it up and disposing of the products themselves; but, in the nature of things, these successes can only be the exceptions, and not the rule. In other words, "the exceptional cases can succeed because they can hang on to the coat-tails, so to speak, of the rest of the industry, and enjoy the benefits (without cost to themselves) of what the industry has developed at great expense and over a quarter-of-a-century of time." Reference is sometimes made to the English experience, where gas companies in a great many cases do work-up their own tar for roads and other uses; but conditions are quite different. Indeed, the difference between English and American conditions as affecting the tar industry is as wide as the ocean between.

The business in tar products has not developed to its present volume and position and importance because of a natural and popular demand for these products, but as a result of a long uphill campaign for years, with the expenditure of millions of dollars for advertising and development work. Instead of the public crying for tar products, it has been necessary to educate them to see that, by proper combination of the various tars and suitable refining methods, distillers can produce standardized commodities which will give high satisfaction over a long period of years. The development of the coal tar chemical industry in the United States has called for research work on a scale so large that no single gas company or group of gas companies was in a position technically to undertake it. The Barrett Company have during the last five years spent on research and development work over $1,500,000. There are several large tar distillers; and there is a very real element of competition, which raises the price of tar to a fair market value. Large as is the production of gas-works tar in the States, it only represents 30 p.ct. of the total. So diversified is the tar business to-day, that no one product represents more than 18 p.ct. of the total.

In conclusion, says Mr. Perry, the good reason, broadly speaking, why the tar industry has developed to such large proportions in America in the hands of private distillers is because they have been able to furnish better service than could have been supplied by the local gas companies. Still better service to the consumer, and greater returns to both producers and distillers, can follow from increased co-operation.

Beneficial Advertising Campaign.

What advertising did for one small town gas man, is explained by Mr. Carl B. Wyckoff, of the Emporia (Hansas) Gas Company. When he took charge of the undertaking eighteen months ago, the annual sales averaged 25 million c.ft.; the leakage was 15 p.ct.; while the Company had never paid a dividend, and were giving the poorest service he had ever seen. Quite a large amount of money was being lost on operating expenses alone. It could be imagined how he felt when he arrived at the conclusion that it would be absolutely necessary to have a 90 p.ct. increase in charge to handle the situation properly. An increase of 25 c. per 1000 c.ft. a few months earlier, with a readiness-to-serve charge of 25 c., had put the people up in arms. Thereupon he planned his publicity policy. The service was improved; and he even resorted to the old idea of weighting-down the holder, by piling tons of bricks on the top of it. With improved service, he began to gain the confidence of the people; and this accomplished, a systematic advertising campaign was started. So well was this planned, that people realized the necessity for an advance, and began to come to him and ask how much it would be. When Mr. Wyckoff finally announced the advance, instead of calling the extra $1 a readiness-to-serve charge, he added it on to the first 100 c.ft., and used a system of charging by the 100 c.ft.; the prices being $1·25 for the first 100 c.ft., and 25 c. for each additional 100 c.ft.

To-day the Company are making a good return upon the investment, and are setting aside ample funds for depreciation and other reserve charges. They are giving good service, are improving the property, and are paying two months' bond interest each month. Moreover, a greater quantity of gas is being sold at the new rates than was sold at the old ones. Already two voluntary rate reductions have been made, and a third was in anticipation at the time the paper was written. Advertising in a small town is about 10 p.ct. advertising, and the balance pure missionary work—especially during these trying times. This is the author's experience.

Mixing Different Gravity Gases.

The results of some experiments with the mixing of different gravity gases in holders are recounted by Mr. H. E. Bates, of the People's Gas Light and Coke Company of Chicago, who says there seems a diversity of opinion as to just how much effect varying mixtures have on appliances. The subject is becoming more important, however, and must ultimately be seriously considered and studied, if companies are to give the most satisfactory service, as economically as possible. Appliances, to give the best service, must receive a gas supply at all times as nearly uniform as possible; and this uniformity applies to three factors—the pressure, heating value, and gravity. The most common method of mixing different gravity gases is probably by means of holders; and this is, no doubt, the best method. But even so, is it not possible that at times such conditions exist that diffusion does not take place, and the mixture in the holder stratifies?

The experiments undertaken were with mixing in a single-lift holder of 1000 c.ft. capacity; the idea being, if the results obtained warranted further investigation, to repeat them later on a larger scale. Before any final conclusions are arrived at, tests should be conducted on a large commercial holder. Inserted through the crown of the experimental holder, about 1 ft. from the centre, were eight ¼-in. sampling tubes, varying in length so that a sample could be obtained at each 1 ft. interval through the vertical section of the bell. The two gases used were a carburetted water gas of approximately ·62 sp. gr. and 525 B.Th.U., and coke-oven gas of approximately ·47 sp. gr. and 560 B.Th.U. Six tests were made under different conditions as nearly as possible similar to those existing in practical operation. While again emphasizing the fact that, until verified on a large scale, the results should not be taken as being conditions that would work out in actual practice, the author says it is believed they justify the statement being made that, where different gravity gases are mixed in a holder, conditions may be such that there is not perfect diffusion, and that the gas sent out from the holder may not be uniform in gravity.

Tables and curves which accompany the paper furnish the following indications: (1) The most uniform mixture of gases is obtained when two gases of different gravities are put into the holder through the same inlet. All other methods seem to indicate stratification of the mixture. (2) Two gases flowing simultaneously into the holder through separate inlets, with no outlet, diffuse gradually. One curve shows that it required approximately five hours, after the inlet was closed-off, before the still gas reached a uniform mixture throughout the holder. (3) When a holder is filled with two different gases at different times, with no output, and after filling the inlet is shut off, the still gas requires considerable time to diffuse completely. The diffusion seems to be more rapid when a lighter gas is first put in than when a heavier gas is first put in. (4) When a gas is put into a holder containing gas of different composition and gravity to that being put in, and a flow out of the holder is maintained equal to the input, there is an arcing across of the gas from the inlet to the outlet. This arcing across occurs approximately 1 ft. to 2 ft. from the water-line. The mixture in the holder, as a whole, is more uniform where a light gas is passed into a holder containing a heavier gas, than where a heavier gas is passed into a holder containing a lighter gas. It follows, therefore, that after closing the inlet and outlet the still gas more rapidly reaches a uniform mixture.

Bibliography on Gas Purification.

As a portion of the work of the Purification Committee for the year, there has been prepared a "Selected and Annotated Bibliography on Gas Purification," covering the more important work which has been done on the theory and practice of gas purification. The bibliography is published by permission of the Director of the United States Bureau of Mines; and the compilers are Mr. A. R. Powell, Chairman of Sub-Committee I. of the Purification Committee of the American Gas Association, and Mr. K. C. Walker, Research Reference Librarian to the Bureau of Mines.

Water-Gas Plant Control.

In a paper to which he gives the title "What Goes on in a Water-Gas Machine?" Mr. M. E. Benesh, of the People's Gas Light and Coke Company, Chicago, says it is apparent that there is a certain fuel-bed temperature which is correct for the conditions of any given machine; and no other temperature is so economical. Depending upon so many factors, this correct fuel-bed temperature, in general, will be different for every set; but at any instant there is some condition towards which a properly operated machine must be tending. How closely does the gas maker keep to this condition? The actual control of the heat distribution in a set is accomplished by means which are slow, and so do not give close regulation. The desirability of accurately determining the condition of the fuel bed—especially as to its steam decomposing power—is thus evident. Carbon dioxide content is only a very imperfect indicator of fuel-bed condition. Some of the most careful and accurate work done on water-gas problems—that of the Bureau of Mines—shows that, with a hot fuel bed, large changes in decomposing properties take place with only small changes in the carbon dioxide content of the blue gas; whereas with a cooler fuel bed, a very small change in the decomposition

will greatly affect the carbon dioxide content. Moreover, each different rate of steam input means a different relation between the temperature of the fuel bed and the carbon dioxide content of the blue gas. Hope for increased efficiency lies either in securing more uniform conditions (such as a continuous process, which the future probably holds for us by the use of cheap oxygen) or in obtaining a rapidly indicating continuous index of the resultant effect of the various factors—*i.e.*, a means for accurately judging the fuel bed condition from moment to moment during both run and blow.

Reference is made to a water-gas indicator (for which a patent is being sought), having for its object to record or indicate continuously the production and fuel bed condition of a carburetted water-gas plant; and this it does by giving directly the percentage of steam decomposed by the fuel bed. The underlying principle of the method is that of the familiar wet-bulb thermometer used for atmospheric humidity determinations. In the application of this principle, simplicity is obtained by having a constant dry-bulb temperature, making possible the graduation of the wet-bulb thermometer in percentage decomposition of steam. The determination is made on the partially decomposed steam leaving the generator. For this purpose, a sample of the mixture of blue gas and steam or water vapour is taken from the generator-to-carburettor connection, at a point beyond the hot valve, and is first screened to remove the breeze. To ensure that the mixture reaches the indicator without condensation, and at a practically constant temperature, the tube through which the sample is taken off is steam-jacketted. This constant temperature (212° Fahr.) is indicated by the dry-bulb thermometer. The temperature indicated by the wet-bulb thermometer depends on the water-vapour content of the mixture. If the gas passing the wet bulb is perfectly dry (as would be the case if the steam were 100 p.ct. decomposed), the wet-bulb thermometer, due to evaporation, would register more than 100° below the dry-bulb temperature. Again, if the steam were not decomposed at all, saturated steam at 212° Fahr. would be passing the wet-bulb thermometer, no evaporation would take place, and the temperature registered would be that of the dry-bulb—212° Fahr. At any intermediate percentage decomposition there will be a certain corresponding wet-bulb temperature which may be calculated from theory—or, better, determined empirically. The wet-bulb thermometer is more convenient when graduated, not in degrees, but in percentage of steam decomposed.

Since this method measures the percentage of steam decomposed, an indicator, together with a steam-meter, gives a measure of the blue gas produced.

Disposal of Waste from Gas Plants.

It appears from the report of the Chairman (Mr. F. W. Sperr, jun., of Pittsburgh), that the attention of the Waste Disposal Committee has in the past year been directed principally to the separation of tar from waste water; and a large part of the report consists of a discussion of tar-separator design, which the Committee have endeavoured to standardize as far as possible with the data at hand. In addition, some study has been made of certain methods of handling and separating tar emulsions; and information regarding the practical application of these is included. There is described in the report a standard design of tar separator, which it is felt should at least be useful as representing the best knowledge so far existing, and as forming a basis for possible improvements. It is recommended that an effort be made to obtain systematic data on separators operating under various conditions.

The rectangular shape, with flat bottom, is recommended; and the figure of 6 gallons static capacity per 1000 c.ft. gas capacity per 24 hours should be tentatively adopted. The static capacity is the volume of liquid that the clean separator system, exclusive of tar wells, circulating tanks, and filter beds, will contain at the minimum liquid level. For plants of 2,000,000 c.ft. daily capacity and over, the separator should consist of three units, with two filter beds. For plants between 500,000 c.ft. and 2,000,000 c.ft., two units with two filter beds will be sufficient.

The depth from the liquid level should not be less than 6 ft.; and ordinarily about 2 ft. additional are allowed for the accumulation of heavy material. The less this allowance, the more frequently must the separator be cleaned. It is therefore recommended that the total depth be fixed at 8 ft. The total length of all units collectively should be from three to five times the width. The spacing of the partitions should be such as to facilitate cleaning. In large plants, where cleaning is performed mechanically, the partitions should be approximately 4 ft. apart; while in plants where cleaning is done by hand, a spacing of about 3 ft. is satisfactory. The next-to-the-last partition in each unit should extend from the top all the way to the bottom, and be provided with a steel-edge weir overflow at the minimum liquid level. This overflow is to be located at one side, so that the character of the water discharged over it may be readily observed. Its width should be about 25 p.ct. of the total width of the separator. Alternate skimming partitions should extend from the top of the separator to about 2 ft. from the bottom; while the other partitions should extend from the minimum liquid level to a point 6 in. from the bottom. A short protecting baffle should be installed near the final liquor outlet in each unit. Each unit contains two compartments; and each compartment should have an arrangement for pumping the tar from the bottom. It has been found desirable to have the suction pipe somewhat flexible, so that the tar can be pumped from a fairly wide area. In many plants, especially where separators are being worked to full capacity, automatic tar overflows to a separate well are very advisable. It is desirable to instal a separate vent pipe in each unit. For plants having two or more separate units, the overflows should be run to a separate tank and re-circulated from this, instead of from the last compartments of the separators.

The Committee recommend, as one of the fundamental rules of correct waste disposal, that a re-circulation system be provided, so that all of the water used in the wash-boxes of the water-gas apparatus can be obtained from the overflow from the tar-separator system. This point was mentioned in the 1920 report, and should be emphasized as reducing the volume of waste to a minimum, and decreasing the work of the filter beds. In a properly operated plant with a tar separator of suitable capacity, there should be no necessity to use fresh water in the wash-boxes. It is important to make a uniform practice of pumping the tar from the bottom of the separator at regular intervals—at least once per day. Pumping should continue until all the good usable tar is removed from each compartment. The temperature of the liquor entering the separator should not be less than 120° Fahr. If any difficulty is found in maintaining a sufficiently high temperature, steam-coils should be installed in the first sections. They recommend separate storage facilities for surplus tar, tar emulsion, and light oil or drip oil, in place of the practice which is sometimes followed of storing these tars and oils in relief holder and storage holder tanks. Reference is made to the use of the Sharples centrifuge for the dehydration of tar emulsions.

With regard to ammonia-still waste, at Milwaukee the problem of disposing of this in such a way as to avoid its objectionable effect on the taste of chlorinated city water, has been solved by a simple method which, if permanently successful, will be of great importance to the gas industry. The method consists in mixing the waste with ordinary city sewage, the bacteria of which are sufficient to destroy the objectionable phenols, if a proper excess of sewage is employed. It is believed that as much as 10 p.ct. of ordinary ammonia-still waste can safely be mixed with the city sewage. In England, a mixture containing as much as 10 p.ct. of gas-plant waste has been successfully treated on bacterial filters; and recently at the University of Illinois as high as 15 p.ct. of similar waste is claimed to have had no inhibitory effect upon bacterial development. In the application of the method by the Milwaukee Gas Light Company, the lime is first separated from the waste by ordinary gravity separators; these being built in two units, which can be cleaned alternately. The clarified waste is then pumped into one of the intercepting sewers, in which it travels about two miles before discharging into the lake. The effluent is entirely satisfactory in quality, producing no objectionable taste after chlorination. This method could find ready application wherever there is sufficient sewage available.

Automatic Gas-Furnaces.

A large number of installations of automatic and semi-automatic charging and discharging gas-furnaces for the continuous heat-treatment of metals are illustrated in Bulletin No. 234 of the W. S. Rockwell Company of New York, which illustrates practical applications of principles outlined in previous bulletins, noticed from time to time in the "JOURNAL," dealing with factors which influence the quality and cost of heated products. The claims of these automatic furnaces are based upon the fact that, to heat a charge uniformly, it is necessary that each piece be exposed to the heat in the same manner, at the same temperature, and for the same length of time, which requires something more than a uniformly heated furnace chamber. With mass methods of heating and cooling, it is unreasonable to suppose that each piece receives the same treatment. It is immaterial what the temperature reading of the furnace or quenching bath may be; for, unless all pieces are both heated and cooled exactly alike, the indication of uniform temperature in the furnace or the quenching bath serves merely as evidence, not as proof, of a final uniformly heat-treated product. The ideal heating condition is secured when the furnace operates with a continuous input and output of material, a continuous input of fuel and discharge of spent gases, and a gradual heating of the material to the final and determinative temperature. The principle of treating each piece individually when heating applies equally to cooling, whether it be quenching for hardening, rapid air cooling for normalizing, or slow prolonged cooling as for annealing. Other advantages of automatic furnaces are that with them one man may do more work, at less cost, than two or three men with a furnace operating on the batch principle; and, again, the automatic furnace requires less floor space for a given output. Such furnaces, of course, are more suitable for adoption in some circumstances than others. The great variety in manufacturing processes and plant conditions frequently calls for automatic furnaces of novel design. One such illustrated is employed to heat the end or a portion of the body of hollow cylinders without overheating the base, in order to facilitate the subsequent crimping, tapering, or other delicate forming operation, without fracture of the metal or uneven surface.

At a meeting to-day of the Newcastle Section of the Society of Chemical Industry, Dr. Geoffrey Weyman is to deliver an address on the "Rate of Carbonization of Coal;" and before the Cardiff Section on Nov. 4, Mr. J. Herbert Canning, of Newport (Mon.), is to lecture on the "Development of Gas Manufacture."

YORKSHIRE JUNIOR GAS ASSOCIATION.

Annual Meeting.

The Nineteenth Annual Meeting of the Yorkshire Junior Gas Association was held on Saturday last, in the Lecture Room of the Fuel Department of the Leeds University. The PRESIDENT (Mr. G. Dougill) occupied the chair; and there was a very good attendance of members.

ANNUAL REPORT.

The annual report, submitted by the Assistant Hon. Secretary (Mr. F. A. C. Pykett)—in the absence of the late Secretary (Mr. F. Peel), who has left Yorkshire—recorded that the past year had shown materially increased interest in the Association's activities by the members generally. Six meetings had been held during the past session, and many phases of the industry were covered by the addresses and discussions. The membership was 143—an increase of seven over that of the previous year. At the Council meetings the attendances had been very good. The Association regretted the resignation of Mr. F. Peel (Hon. Secretary), owing to his appointment at Tyldesley.

The financial statement, submitted by the HON. TREASURER (Mr. C. Roper), showed a balance in hand, after meeting the expenses of the year's working, of £16 19s. 2d., as against a balance of only £1 18s. 4d. at the commencement of the year.

Mr. J. DEMAINE (Ripon) proposed the adoption of the report and accounts, and remarked upon the great financial improvement of the Association, as well as its educational progress.

Mr. H. RHODES (Bradford) seconded; and the report was adopted.

OFFICE BEARERS.

The election of officers for 1921-22 resulted as follows:

President: Mr. Peter M'Nab (Low Moor), who has given many years' service to the Association until last year, when he was elected Senior Vice-President.

Senior Vice-President (Mr. A. E. Leask, last year's Junior Vice-President having withdrawn owing to residence at Harrogate): Mr. H. L. Bateman (Wakefield).

Junior Vice-President: Mr. W. Heathcote (Halifax).

Hon. Treasurer: Mr. C. Roper (Bradford) re-elected.

Hon. Secretary: Mr. F. A. C. Pykett (Halifax).

Assistant Hon. Secretary: Mr. H. Wilde (Bradford).

Two Additional Members of Council: Mr. G. V. Edwards (Leeds) and Mr. S. H. Packer (Bradford), re-elected after retirement on rotation.

Mr. M'NAB, on taking the chair, said he appreciated the honour done him in electing him to the position. He drew attention to the desire of the members to raise a small fund to make some little testimonial to Mr. F. Peel, their late Secretary, in appreciation of his services before he left Yorkshire and went into Lancashire.

Mr. S. T. S. MUSGROVE (Sheffield) proposed, and Mr. L. BATES (Sheffield) seconded, a vote of thanks to the retiring officers and Council.

Mr. G. DOUGILL, in responding on behalf of his late colleagues in office, said the best thanks for their work had been the excellent attendance of members during the past session. He wished to pay tribute to the energy and services of Mr. Peel, their late Secretary, who had taken over the secretaryship at a time when, owing to the long illness of the former Secretary, the Association had got into a rather difficult position.

THANKS TO THE LEEDS UNIVERSITY.

On the motion of the PRESIDENT, seconded by Mr. PYKETT, a hearty vote of thanks was awarded the authorities of the Leeds University and Prof. Cobb for the many facilities granted to the Association year after year. He said it would probably surprise the University authorities if the success in various parts of the world of men who had passed through the Association, with the assistance of the University, could be tabulated.

AN ADDRESS BY PROF. COBB.

Prof. J. W. COBB then delivered an address on the "Products of Coal Carbonization." This will be found on p. 310.

Mr. DOUGILL said the address had been one of the most interesting the Association had ever had, and had been eminently suitable to such an occasion in their proceedings. The address had been an education in what had been done and what still would be done with coal.

Mr. J. LISTER COOPER, proposing a vote of thanks to Prof. Cobb, remarked that the gas industry owed a great and incalculable debt of gratitude to him for his work in fuel and scientific research—all to the end of progress in the gas and allied industries. They had listened that afternoon to a theoretical paper on methods of investigation into the properties of coal which must open up a very wide field for inquiry and thought. The practical distillation of coal must be profoundly interesting. Many of them who were on small works could not go into it as fully as they would like to do; but it was a glorious thing that they had a department like that at Leeds University, and men like Prof. Cobb to give them some little opportunity of actually taking part in the inquiry, to their lasting benefit. The address would give them all much to think about; and when they could see it in print in the Technical Press they would be able to study it more closely than in listening to its delivery.

Mr. C. ROPER, in seconding the vote of thanks, said the Association were very appreciative of the readiness with which Prof. Cobb agreed to the request of the Council to give an address.

The motion was carried unanimously.

Prof. COBB, in reply, thanked the Association for the repeatedly kind way in which his addresses were received. This address in particular he had been a little doubtful about, because he knew it was not directly connected with the detail of the members' daily work; and while he thought it was a matter on which they ought to have some little insight, he had a fear—which he now realized was quite needless—that it might be received somewhat in impatience.

Prof. Cobb illustrated his remarks by exhibiting a chart of microscopic sections showing the structure of coal, prepared by Mr. Lomas, of St. Helens, some slides prepared by the same gentleman, and some microscopic slides of refractory materials.

RICHMOND GAS STOVE AND METER COMPANY'S EXTENSIONS.

An Auspicious Occasion at Warrington.

GENERAL VIEW OF THE WORKS FROM THE MANCHESTER SHIP CANAL.

A large gathering of those interested and engaged in the gas appliance industry took place last Wednesday, at the works of the Richmond Gas Stove and Meter Company, Ltd., Grappenhall, near Warrington, on the occasion of the formal opening of new offices and extension of works. Conveyances awaited visitors at the London and North-Western Railway Station at Warrington, for the convenience of those who reached the town by train—the Grappenhall works being situated on the banks of the Manchester Ship Canal, some two miles from the town. The assemblage, as the guests of the Richmond Company, included the Lord Mayor of Manchester (Alderman W. Kay), who is also Chairman of the Manchester Gas Committee; Alderman Cunliffe (Vice-Chairman of the Manchester Gas Committee); the Mayor of Warrington (Councillor Robert Henshall), Sir W. Peter Rylands (President of the Federation of British Industries), Sir Gilbert Greenall, Mr. Upton and Mr. Gibson, of Liverpool, Mr. Rudge and Mr. Russell (Managing Directors of Fletcher, Russell, & Co.), &c., &c. The opening ceremony was held in the large building which is to be the stove warehouse, adjoining the new and handsome offices.

The new offices form a magnificent suite fronting on the

Manchester Ship Canal. There is a spacious entrance hall, leading past various offices on either side to the main stairway, which divides to reach the large open main landing serving for the Board room, the Directors' and Secretary's rooms, and corridors leading to offices and parts of the works. The interior is very handsomely appointed in oak panelling and other suitable decoration, and is arranged in a general scheme indicative of the success of the concern, coupled with a proper dignity.

After the guests had been formally welcomed by the Directors, the party adjourned to the new warehouse—a place of great spaciousness and excellent natural lighting and ventilation—where a platform had been erected for the occasion. The chair was occupied by Mr. John Coxon, J.P., Chairman of Directors of the Richmond Company.

Mr. Coxon remarked that, in opening the new offices and extended works, the Company were realizing and carrying into execution a scheme which had been approved by the Board some years ago, but had been held-up by the outbreak of the war. The urgent call for munitions had then taken every ounce of energy, and the Company had no time to build offices. Now that those times were over, they felt that it was up to them to make war on the overcrowded, and therefore not too healthy, offices in Academy Street, Warrington, which had hitherto had to serve the purposes of their loyal staff. The visitors must not infer, from the building of these new offices, that trade was exceptionally good just now. This was not a time, in any British industry, for unnecessary expenditure. But the health and welfare of the staff and employees was the Company's first consideration; and by removing from the crowded and inconvenient offices to the new and spacious buildings, the Company were doing a service, not only to their employees, but also, indirectly, to the shareholders. They were honoured that day by a very distinguished man in the person of the Lord Mayor of Manchester, who had come to them despite the many calls upon him. They thanked the Lord Mayor, and also the Mayor of Warrington, for being present.

Some Reminiscences.

Mr. J. W. Slack (Managing Director) gave a general outline of the history and progress of the business. The Company started in

The Foundry.

October, 1890, with Mr. Unsworth and Mr. Richmond in charge, and went under their joint names. The early firm made a very good cooker, though only an indifferent gas-fire in those days. The proof of the cooker had been evidenced only during the past few weeks, when there came to them for repair one of the cookers turned out by the original concern, and bearing the two names of the founders. It must have been a good cooker to be still in use after so many years; and he considered it such a testimonial to the firm's long reputation that, instead of repairing it, they acquired it for the Company. After Mr. Unsworth left, the firm changed its name (becoming Richmond & Co.), and progressed very rapidly. Many years ago the policy was decided upon of concentrating all the manufacturing on one site at Grappenhall. The war had stopped the progress of the Grappenhall scheme; but that day's ceremony marked the completion of the works and general offices on the site of over 20 acres. The whole of the processes of manufacturing gas-stoves of all types, both domestic and industrial, were carried on there in their entirety, including such complementary work as enamelling, ironfounding, &c. The more important departments at Grappenhall included foundry, fitting shop, grinding shop, enamelling department, gas and solid fuel furnace department, and laboratory. Two years ago the Richmond Company and several other large gas-stove manufacturing concerns joined in the formation of Radiation Ltd., a combination for which he was confident there was a great future. They at Warrington had a good staff and good workpeople. He did not say they had never had their little troubles with workers (like other firms) on labour questions—because they had about fourteen unions to deal with; but generally they had been able to meet the Shop Committees and settle matters very well. They had a fine office staff.

Importance of Good Appliances.

The Lord Mayor of Manchester, in declaring the offices open, said it was with particular pleasure that he performed this little duty, because he believed it would help the Company to progress, to the benefit of the community. He had for a long time taken a keen interest in the provision of proper appliances for the use of gas. He realized how strongly the industry was up-against old-fashioned notions as to the open coal-fire; but the opportunity for pressing the lesson of gas had come through a national calamity. The object lesson of the coal strike would be with the nation for all time. None of them would have believed, prior to this event, that the country could carry on for fifteen weeks practically without coal. Fourteen or fifteen years ago he had set out for standardization in gas appliances. In Manchester they equipped a laboratory for testing. Features which would always sell appliances were ease of replacement, the standardization of parts, general all-round efficiency, and a proper price. Such provisions placed the business of the Manchester Corporation Gas Department very largely in the hands of the Richmond Company; and his confidence had never been abused. He could safely assert that the Corporation had been saved scores of thousands of pounds. [Applause.] To-day, more than ever, efficiency, economy, and all-round utility of appliances must dominate the gas industry. When he first heard of Radiation Ltd., he said this was what ought to have happened years ago. The industry would insist on the very latest and best results that scientific research could produce, and must standardize on the best lines, in order to avoid multiplicity of spare parts and the time formerly taken in getting an article for renewal. This problem being out of the way, it was up to each gas company or gas department to see that its own house was in order, so that possible additions might be made to the improvement of city life, and another nail knocked into the coffin of "Old King Coal" as a direct fuel. He had long been an advocate of gaseous fuel, for heating especially; and he believed the era of gas had only just commenced in reality. He had no fear of the competition of electricity. It might have claims for lighting, but it had "not a leg to stand on" against gas for heating. It was up to the industry to produce, not only the best of appliances, but also a suitable and proper gas. The very spasmodic effort that had been made to convert public opinion to electricity by the scheme of super-power stations had already had the bottom knocked out of it. If the steam-turbine was the best method of producing electricity to-day, then the best method of producing the necessary steam was by gaseous fuel. The Richmond Company had contributed in no small measure to the success of the Manchester gas undertaking by the readiness with which they had met demands. Referring to the Manchester Corporation Act, which included certain gas provisions, he said all Manchester wanted

The Fitting Shop.

was service to the community. If they could sink their own individual idea with regard to gas manufacture or supply in bulk, he claimed that now was the time to put themselves in order. He did not think there was room for small undertakings to make gas themselves, if it were possible to buy for distribution more cheaply. There was nothing in the world that paid so well as pushing one's goods; and the best advertisement the gas industry could have was a good appliance, properly fixed, so that there would be no complaint as to service. Such good service had led to wonderful development in the sale of gas in Manchester. In formally declaring the offices and extensions open, he hoped the Company, the employees, and the community would benefit by the development.

Votes of Thanks.

Mr. H. James Yates, F.C.S. (Chairman of Radiation, Ltd.), moving a vote of thanks to the Lord Mayor, said he did wish to impress on the gathering the great asset Alderman Kay was to the gas industry. His energies had not ceased with his chairmanship of the Manchester Gas Committee. He had thrown himself into the work of the British Commercial Gas Association, of which he was one of the first Vice-Presidents, and had given much valuable advice and help to the officials of that body. The gathering might form some idea of the national asset of Radiation Ltd., when they considered that the five works they were visiting that day were only one of sixteen belonging to them, whose works in total area covered over 100 acres, employing more than ten thousand workpeople. He recognized that industrial combinations were sometimes looked upon with suspicion; but Radiation Ltd., were most certainly not out to keep-up prices. They were out to cut down prices by taking away all unnecessary outside competition, by internal competition, and by duplication of patterns by the various firms. In this way, with the pooling of brains, and the production of standardized parts, they could manufacture more cheaply. The backbone of their success had been the research work in their laboratories; and they were now establishing a central laboratory in London, where they would use the best brains in the Company. If they found any better outside, they would not hesitate to use them also. He personally, and on behalf of the Board of Radiation Ltd.,

thanked the Lord Mayor for opening the new offices, and Sir Peter Rylands and the Mayor of Warrington for their presence.

Mr. H. M. THORNTON, J.P. (Vice-Chairman of the Richmond Company), seconding the vote of thanks, said the policy which they were there that day to celebrate was inaugurated at least twenty years ago. To him (as having been largely associated with the policy) it was a red-letter day. It had been his privilege to have the personal friendship of the Lord Mayor for many years; and he would like to say how often, in their younger days, when times were not always bright, Alderman Kay's optimistic outlook had cheered them up, and speeded them on their way. In regard to the Richmond Company, not only was a manufacturing policy adopted twenty years ago, but also the guiding policy of the business, that it should be based on rendering good service. He thought if "Service before Self" could be written up everywhere, and got into people's minds, it would be very much better for the country now and for the future. He had a list of names of important gas engineers, representing 300 gas undertakings, who had written personal letters to him regretting inability to be present that day. This alone showed that the policy of the Company had been sound from its inception, and it was very gratifying to receive so many expressions of goodwill. They had sent an invitation to Lord Derby; but being unable to be present, his lordship had sent the following message: "I much regret that absence from Lancashire prevents me from accepting your kind invitation. I wish you every success. Everything that can give employment at present is well worthy of the good wishes of the rest of the community." [Applause.] This was a fine message, and one for which they were grateful. They had also sent an invitation to Lord Leverhulme, but in unavoidable absence, he had written: "I regret I am unable to accept the invitation to the opening of your new offices and works extensions. I congratulate your Company on the progress it has made, and on its introduction of so many facilities for the uses of gas for cooking and heating. These in turn have done much to increase our home comforts. I wish your Company every success." Mr. Thornton also mentioned the receipt of letters from Sir Robert Hadfield and Mr. Milne Watson. In conclusion, Mr. Thornton again expressed the gratitude of the Board to the Lord Mayor for being present and associating himself with their important side of the gas industry.

The vote of thanks was put to the meeting and carried unanimously.

The MAYOR OF WARRINGTON proposed a vote of thanks to the Chairman, and remarked that his own association with Warrington—he had been born there—was long enough for him to remember the small beginnings of the present great concern of Richmond's. All in Warrington knew and esteemed Mr. Coxon as one of the leaders in that town of many industries. Warrington felt the works of Richmond's, and those of the associated Company of Fletcher, Russell, and Co., to be great assets to the town. Overcast as the industrial sky was at present, his worship expressed confidence that recovery, though it might be slow, was certain, so long as the country had the enterprise, resources, and dogged perseverance of such firms.

Sir W. PETER RYLANDS, seconding the vote, endorsed all that had been said about Mr. Coxon, one of his own fellow-townsmen. Most of the speakers had approached the afternoon's subject either from the point of view of interest in the well-being of Radiation Ltd., or of interest of those who were intimately connected with the use of the apparatus manufactured. He spoke more as a representative of one of the humble public; and from this point of view he was proud of Warrington as a town, and of the Company. Gas-cookers, he believed, had their initiation in Warrington. He was pleased to testify, on behalf of the public, their admiration of the work being done by the Richmond Company. The public were always suspicious of combines; and he was not prepared to say that some combines were not out to put up prices. He, however, could unhesitatingly express the belief that this was not the case in the majority of companies; and he was satisfied that there was no such intention on the part of Radiation Ltd. The supply of gas-cookers, gas-grates, and industrial appliances was a matter of very great moment to the community; and the success of the company which provided the supply must depend on the form in which the wares were offered, their character, and their price. In the case of any gas appliance it was vitally important that the greatest possible amount of ability should be directed to finding out the best and most economical form. Further, the sale of gas-apparatus depended on the extent to which they could be popularized; and for this purpose cheapness was manifestly a most important point. Therefore he was satisfied that it must be to the first interest of Radiation Ltd., that they should present their wares to the public in the best and cheapest form. The question of fuel economy was of vast importance to the nation. The waste of the vital products of coal through open-fire combustion was stupendous, and must be viewed with apprehension. Any development in the use of coal in the form of gas must therefore be of the greatest national benefit. He extended the congratulations of the general public, as consumers, to the Company on the milestone reached that day.

After the Chairman had replied, the visitors were taken round the works in parties, and provided with light refreshment.

The panelling, decorating, and fitting of the whole of the new offices was much admired. This work has been carried out by the Nautilus Fire Co., Ltd., of No. 60, Oxford Street, W.

THE VISITORS AT THE GRAPPENHALL WORKS.

Future Control of the Coal Markets.

"Will the United States or Great Britain control the coal markets of the world in the coming years?" is a question asked by Mr. Floyd Parsons, of New York, in an article in "World's Work." The prosperity of the United States is, he says, largely dependent on a well-managed and profitably operated coal industry. For this reason, the building-up of a world-wide coal business must be encouraged. We are living in an age when world power depends upon the relatively cheap production of coal and iron; and a nation that deliberately throws away its advantages in this respect, is, economically speaking, digging its own grave. Prior to the war, the British transacted 71 p.ct. of the entire seaboard coal trade of the world. At that time British exports totalled more than 76 million tons, and, in addition, Great Britain supplied 22 million tons each year to coaling stations and for ships' bunkers. At the present time, however, British exports of coal are running at the rate of less than 25 million tons annually. The nations of the world which have no coal at all, or only an insufficient supply, require in the neighbourhood of 100 million tons of coal each year; and this fuel must come either from the British Isles or the United States. That America has a great opportunity in this world field is, says the writer, clearly evidenced by a study of the facts in the case. Last year in Great Britain the output per man employed was 193 tons; whereas in the United States the average production per man is upwards of 900 tons a year. In 1920, British mine-owners employed 10 p.ct. more miners than they did in 1913; and, with the additional numbers, the colliers produced 58 million tons less coal. The cost of coal in England for the month of March was more than 39s. per ton, which, with the pound sterling at par, would be the equivalent of approximately $10 per ton. In the United States, on the other hand, it is a poor mine that cannot produce bituminous coal for $3 or $3·50 per ton. Certainly, now that America has plenty of ships, Great Britain must reduce her costs of mining at least 50 p.ct., if she would compete successfully in foreign markets with American coal exporters. Furthermore, in order to return to her former position of pre-eminence in the coal world, Great Britain must produce considerably more than the quantity now being mined.

Paris Gas Finances.—The price of Paris municipal gas, says the correspondent of the "Daily Telegraph," will be maintained until 1922 at 55 c. the cubic metre. To those interested in the financial situation of the Gas Company, which is dependent on the municipal government of Paris, it is shown that at the close of last year the deficit accumulated since 1915 reached the figure of 173,000,000 frs., a deficit which falls upon the municipal budget. It is further pointed out that, if the City Council do not wish to incur a fresh deficit, and are anxious to maintain the balance of the gas budget without attempting to recover the 173,000,000 frs. lost, it will be necessary to retain the present tariff at least until the end of next year, at which time new rules will come into force.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Orders Obtained under Section 1 of the Gas Regulation Act, 1920.

SIR,—With reference to the letter in your last issue by "Enquirer" as to whether the standard price of gas per therm would be altered by any variation in the declared quality of the gas supplied, I think he can be assured that once a standard price has been fixed per therm the operation is finished so far as the question of the quality of the gas is concerned. A therm is 100,000 B.Th.U. in all circumstances; the declared quality of the gas merely indicating in a sense the number of cubic feet which will be required to deliver the units.

If the writer will turn to an article by "Engineer" in your issue of Oct. 6, 1920, and to my reply in the issue the week following, I think he will find this matter fully discussed and set-out. H. E. IBBS.

Accountant's Department, The Gas Light and Coke Company, Horseferry Road, Westminster, Oct. 24, 1921.

Water Gas Research.

SIR,—Will you allow me to draw the attention of your readers to the valuable contribution by Mr. A. O. Jones on p. 242 of the last "JOURNAL."

The process of water-gas manufacture, as frequently carried out, is thermally inefficient, and can be greatly improved if the theoretical considerations and methods of working emphasized by Mr. Jones are appreciated and practised. The essence of the matter is to conserve the heat units of the coke in the generator where high temperatures are of great value. If fewer potential heat units are blown away, there will be less need to attempt to capture them afterwards.

Having expressed my hearty agreement with the main arguments, I have also to express disagreement with the way Mr. Jones dismisses, as wasteful, the manufacture of enriched water-gas by steaming vertical retort charges.

I would suggest that if Mr. Jones will study the tables and graphs in the Fuel Research Board's report, he may have cause to modify his judgment, and he may even be provided with useful matter for another of his illuminating articles. THOS. GLOVER.

British Gaslight Company, Ltd., Norwich, Oct. 21, 1921.

The Sixth Institution Report.

SIR,—I wish to draw attention to an error which appeared in the comments made with regard to the Sixth Report of the Gas Investigation Committee on the manufacture of blue-water gas, on p. 177 of the last issue of the "JOURNAL." It is stated that I pointed out that the investigation of the blue water-gas plant gave an average efficiency of 42 p.ct., making allowance for the raising of steam and driving the blower. The figure actually given was 46 p.ct., as correctly stated in your verbatim account of my remarks introducing this report. I should be glad, therefore, if you would kindly draw attention to the point in your columns. A. PARKER.

Leeds University, Oct. 22, 1921.

The Congdon Retort Stand-Pipe System.

SIR,—I have read with a great deal of interest the paper entitled "Ascension Pipe Developments," by Mr. W. H. Warren, of Beckton, and, also, your editorial entitled "Threatened Descension of the Ascension," in the "JOURNAL" for Sept. 28.

The apparatus as installed at Beckton does not represent the latest developments. In this country, we are now using a cast-iron valve box from which extend 8-in. steel pipes to reach the hydraulic main above, and individual seal-pots below. The liquor overflows from these seal-pots into a pipe-line which extends to the separating tank or tar well. We experienced the same difficulty with the thin metal steel stand-pipes as has been referred to by Mr. Warren; but we have had no trouble with our valves, and have not had a stand-pipe stoppage for seven years, which is the length of time we have operated my patented stand-pipe system at the Atlanta Gas Works.

We have no trouble with the retort stand-pipe connections, as these are very short, and the tool used to clean them is of practically of the same diameter as the internal diameter of the connection; and this tool is pushed through the connection each time the retort is open for charging. Of course, the lower seal-pots have to be cleaned from time to time; but this entails very little labour. It would be desirable, as Mr. Warren states, to do away with the retort stand-pipe connections, and fasten the stand-pipe to the retorts. This construction would, however, have some disadvantages. It would be extremely rigid, for one thing, and would require very exact work in order to assemble the various parts properly. The short connection between the retorts and the stand-pipe makes the apparatus more flexible and very much easier to construct.

It is necessary to have a man on the operating floor, to open the lids; and this man keeps the retort stand-pipe connections clean. I notice that Mr. Warren passes 8 gallons of liquor per minute down each stand-pipe. This quantity, I think, is unnecessarily large; and we have found that 1¼ gallons, and even less, is sufficient where three retorts are connected to a single pipe.

Mr. Warren suggests the advisability of placing the hydraulic main in the basement. I object to this location for reasons referred to by Mr. Warren in his paper. In closed retort-houses it is much safer to have the hydraulic main on top of the bench, where, should any gas escape, it would pass up through the roof of the retort-house, instead of being trapped below the operating floor, where it might prove dangerous. My stand-pipe system has been applied to many old settings in this country; and in accomplishing this, it is very much better, I think, not to change the location of the hydraulic main.

R. C. CONGDON.

Georgia Railway and Power Company, Atlanta, Oct. 13, 1921.

Gas v. Electric Furnaces.

SIR,—We should be very pleased if any of your readers could supply us with information concerning the cost of running gas-heated furnaces for the heat-treatment of steel. We desire to know what the number of cubic feet of gas amounts to per pound of steel treated.

We have already some information upon this point, and so far have found that the cost of gas heating invariably exceeds the cost of heating by electricity. There may, however, be on the market a gas-furnace more economical than any that we have yet met with, in which case we should like to hear of it.

AUTOMATIC AND ELECTRIC FURNACES, LTD.,
E. P. BARFIELD, Managing Director.

281-283, *Gray's Inn Road, London, W.C., Oct. 20, 1921.*

[Several articles have appeared in our columns dealing with this question. We have no doubt that some of our manufacturers of furnaces will give actual figures from working experience. But as a preliminary, it would have been an excellent starting-point to have had from our inquiring correspondents the information in their possession, which so far has shown that "the cost of gas heating invariably exceeds the cost of heating by electricity," together with the charges per unit of electricity and per 1000 c.ft. of gas with the calorific value of the latter.—ED. "G. J."]

PARLIAMENTARY INTELLIGENCE.

Parliament re-assembled after the summer adjournment on Tuesday, Oct. 18.

HOUSE OF COMMONS.

Gas Regulation Act, 1920.

A copy was presented of a Draft Special Order proposed to be made by the Board of Trade under this Act, on the application of the Hayling Island Gas Company, Ltd.

Dumbarton Gas Supply.—In his report to the Town Council on the operations of the Dumbarton Gas-Works for the year to May 15, Mr. James Bell (the Manager) states that the quantity of coal carbonized amounted to 9421 tons, from which there was obtained 121,105,000 c.ft. of gas, averaging a yield per ton of 12,854 c.ft. This yield was an improvement of 584 c.ft. per ton on the preceding year. The total increase in the quantity of gas made was 8·12 p.ct. As a matter of fact, record figures were revealed in the past year's work. The net profit on the working was £3021. The Provost remarked that, taken altogether, he thought that the gas finances might be concluded to be in a sound state.

Gas Complaints at Brownhills.—Arising out of the continued complaints of the Brownhills Urban District Council about the bad supply of gas to the district, the Chairman of the Gas Company (Mr. Thomas Vaughan), with Mr. Stewart (Consulting Engineer to the Company), interviewed the Council on Wednesday last. Mr. Vaughan said he had been in business for sixty years, and had never had anything that had given him so much worry as the Brownhills Gas Company. He and his family were largely interested in the concern; and they had had no dividends for the past four years. They had experienced great difficulties owing to mining subsidences, and from other causes; but £3000 was now being spent on the retorts, and they were confident of being in a position to give a good supply of gas. Mr. Stewart pointed out that before the war coal was obtained at 14s. per ton; but the price was now 42s. 9d.. Cannock Chase coal had been tried; but only 5000 c.ft. of gas could be obtained, where 14,000 c.ft. could be extracted from the proper gas coal. The plant at the works would produce 30 million cubic feet of gas per annum, which would be adequate, as the amount sold had not hitherto exceeded 16 million cubic feet. It was agreed that the quality of the gas had very greatly improved recently.

Glenboig Union Fire-Clay Company, Ltd.—Submitting to the shareholders the balance-sheet as at Aug. 31, the Directors express regret that, in the course of the year, the Company have through death lost the valuable services of two Directors—Mr. James Dunnachie and Mr. Henry Morgan. Mr. Dunnachie, the founder of the Company, had since its formation been Managing-Director, and had also been Chairman since 1906. Mr. Morgan had been a Director since 1905. Mr. James Dunnachie, jun., has been appointed Chairman in place of his father; and to fill the vacancy on the Board through the death of Mr. Morgan, the Directors appointed Mr. William H. Mair, one of the larger shareholders. The Court of Session by a majority—two Judges dissenting—upheld the decision of the Special Commissioners of Income-Tax on the question of the Company's liability for excess profits duty. On the advice of Counsel, the Company have appealed to the House of Lords; and the matter is still undecided. In the accounts, however, ample provision has been made for the Inland Revenue claims should the appeal be dismissed. The net profit for the year under review, including £17,848 brought forward (less Directors' and Auditors' fees) amounts to £50,172, out of which £10,000 has been placed to general reserve. The payment of the dividend recommended, at the rate of 20 p.ct. (less income-tax), will leave £19,172 to be carried forward.

REGISTER OF PATENTS.

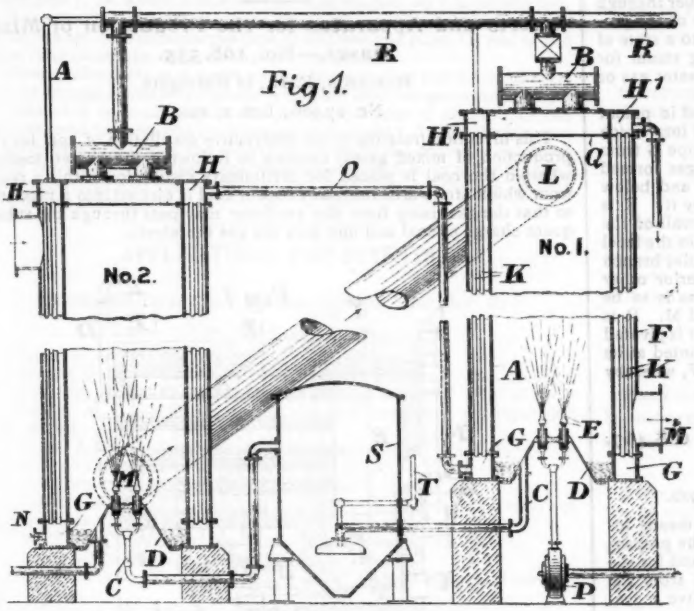
Recovery of Ammonia from Ammoniacal Liquor.

No. 167,719.

HOLMES AND CO., LTD., and BOOCOCK, M., of Huddersfield, and WYLD, W., of Leeds.

No. 515; Jan. 6, 1921.

This invention of apparatus for the recovery of ammonia from ammoniacal liquor, refers particularly to a process of the type in which the liquor is heated and sprayed successively into a plurality of chambers at suitable pressures—the spraying in the second and subsequent chambers being effected by the pressure in the first or previous chamber.



Boocock and Wyld's (Holmes & Co.) Ammonia Recovery Plant.

The object of the invention is to provide apparatus in which the liquor is heated by passing through tubes enclosed in heating jackets surrounding the spraying chambers, and through which hot waste-gases are circulated. By this means, the recovery of the ammonia is rendered more complete, and is effected with economy. In the method employed no steam need be used; and the apparatus may be applied either to the manufacture of ammonium sulphate or pure ammonia.

In the preferred arrangement shown distillation is carried out at different pressures in the respective chambers as follows: Ammoniacal liquor, as received from the gas-works, is passed through tubular heaters, which form jackets for the stills, and is sprayed into the first chamber under an initial pressure, after which the spraying of the liquid in the second chamber is effected by the pressure in the first chamber.

Pressure in the first chamber is maintained and governed by a regulating valve on the outlet pipe of the chamber in the usual manner.

For treatment of fixed ammonia salts the liquid may pass through an intermediate chamber containing a reagent without releasing the pressure, as is known in plant of this type.

Any number of chambers, as described, may be combined in this way—the spraying being effected by the pressure in the preceding chamber; the pressures being each controlled by a valve on the outlet pipe of each chamber.

The heat necessary for heating the liquor and the distilling chamber is supplied by waste flue-gases.

When pure ammonia is to be produced, the liquor is first heated and sprayed into a heated chamber, and the gases set free are passed through an absorbing still in which the ammonia is again absorbed and the undesirable gases, such as carbon dioxide and sulphuretted hydrogen, are set free. The purified liquor is then sprayed into further heated chambers as above described.

The illustration shows the apparatus as used for the manufacture of ammonium sulphate. Two distilling chambers of similar construction are employed, together with an intermediate chamber, which is used for treatment of "fixed" ammonia salts.

A represents the chamber into which the liquid is sprayed; B the outlet pipes, with regulating valves; and C the liquor discharge. The outlet pipes are preferably constructed to stop any moisture passing over with the gas. In the bottom plate D, one or more centrifugal spray nozzles E are fixed, so that the liquor is discharged vertically. The nozzles are so arranged that they may be withdrawn for cleaning purposes. A flue chamber F is formed by an outer casing encircling the still chamber; and liquor inlet and outlet chambers G H run round the bottom and top of the flue chamber respectively, and are connected by tubes K. Waste gases taken from furnace flues enter the chambers at the top by the pipe L, and pass out at the bottom through the pipe M. The stills may be connected so that the gases flow first round No. 2 still and then round No. 1, as shown.

Cold liquor enters No. 2 still by the pipe N and passes up through the tubes into the outlet chamber H. From here it passes through the pipe O into the inlet of No. 1 still, and up through the tubes into the outlet chamber. By the time the liquor has passed through the flue chambers of both stills, it has been heated to a high temperature, and on leaving the chamber H^1 on No. 1 still it is passed through a pump P, and sprayed into the first distilling chamber.

Owing to the fine state of division that the liquid undergoes in this heated chamber, the free ammonia in the liquor as given off passes upwards through the openings in the plate Q and into the pipe B, and finally into the common pipe or main R which is connected to the saturator.

After the elimination of the free ammonia, the remaining liquor falls to the bottom of the chamber and is passed from there into a separate intermediate chamber S. Here it is mixed with any desired reagent for the treatment of the fixed ammonium salts—the reagent being introduced through the pipe T. No pressure is lost by the liquid passing through the chamber S and the initial pressure in No. 1 still causes the liquid to be sprayed in No. 2 still. The pressure in the latter is, of course, considerably less than that in the former.

By virtue of the treatment received in the intermediate chamber S, the liquid on being sprayed in No. 2 still is stripped of its fixed ammonia, which passes upwards through the pipe B into the main R, and is taken along with the gas from No. 1 still to the saturator for the formation of ammonium sulphate.

The spent liquor falls to the bottom of the chamber and passes away to the settling tanks.

Production and Utilization of Gas.—

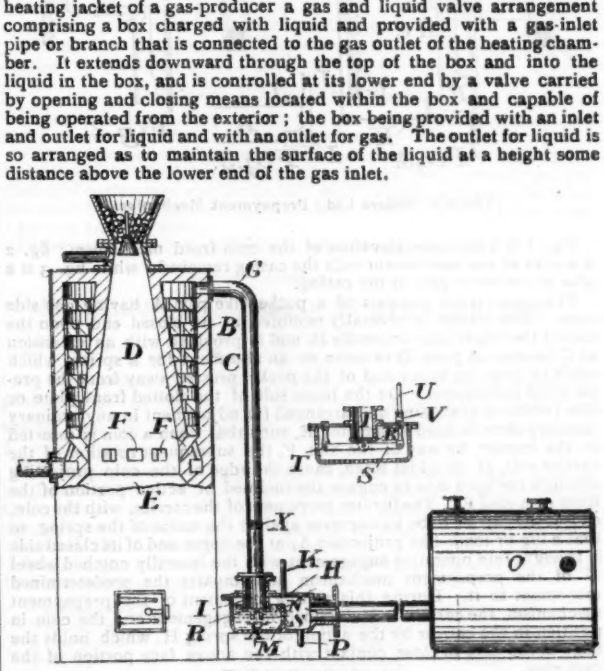
No. 168,432.

TULLY, C. B., of Victoria Street, Westminster.

No. 15,489; June 8, 1920.

This invention relates to the manufacture of gas according to which air is caused to pass through a mass of fuel in the lower part of a producer for the purpose of raising the fuel to incandescence preparatory to introducing steam or steam and hydrocarbon into it so as to produce water gas, methane hydrogen, and similar gas for heating and lighting purposes. The producer gas generated during the blowing-up stage is caused to pass through a chamber forming a jacket of a fuel retort surmounting, and in free communication with, the incandescent fuel chamber below, so as to heat the retort and its fuel contents to a high temperature. In such a method of producing gas, after leaving the jacket, the gas is usually delivered into the external atmosphere past a snift-valve (that is closed when the blowing-up stage is finished), and steam or steam and hydrocarbon is or are injected into the mass of incandescent fuel. In such method of manufacture, the ammonia and tar present in the producer gas leaving the jacket are lost, as is also the calorific value of the gas; while (as the patentee points out) the discharge of the gas direct into the external atmosphere is objectionable.

The present invention has for its object to recover the ammonia and tar in the gas and to utilize the heating value of it. For this purpose there is combined with the gas outlet pipe or conduit of the retort-heating jacket of a gas-producer a gas and liquid valve arrangement comprising a box charged with liquid and provided with a gas-inlet pipe or branch that is connected to the gas outlet of the heating chamber. It extends downward through the top of the box and into the liquid in the box, and is controlled at its lower end by a valve carried by opening and closing means located within the box and capable of being operated from the exterior; the box being provided with an inlet and outlet for liquid and with an outlet for gas. The outlet for liquid is so arranged as to maintain the surface of the liquid at a height some distance above the lower end of the gas inlet.



Tully's Gas Producer.

The arrangement is such that the producer gas escaping from the heating jacket of the retort will be caused to pass through, and become washed by, the liquid in the box, whereby the ammonia and tar in the gas will be removed, and the washed producer gas will escape through

the gas outlet from the box. From the outlet the producer gas may be led to boiler furnace, internal combustion engine, or other place where its calorific value can advantageously be utilized.

To enable a continuous supply of producer gas to be supplied to a boiler, internal combustion engine, or other place, two producers may be used, each having the outlet from its retort-heating jacket connected to a gas-washing box—the gas outlets of the several boxes delivering into a common gas-supply pipe. Or the several gas outlets from the heating jackets may deliver into a gas washing-box common to all.

The illustration shows (partly inside elevation and partly in vertical section) a gas-producer of the kind referred to, having its retort-heating jacket combined with a gas-washing arrangement; also a vertical section of the gas-washing arrangement taken on the line X,

The producer has a chamber B with chequerwork C forming a jacket to the fuel retort D, which surmounts, and is in communication with, the gas generating chamber E below. The jacket is in communication at its lower end with the upper part of the chamber through openings F, and having a pipe G at the top for the escape of the producer gas formed when raising the fuel in the chamber to a state of incandescence by an air-blast preparatory to introducing steam (or steam and hydrocarbon) for producing, in known way, water gas or methane hydrogen gas.

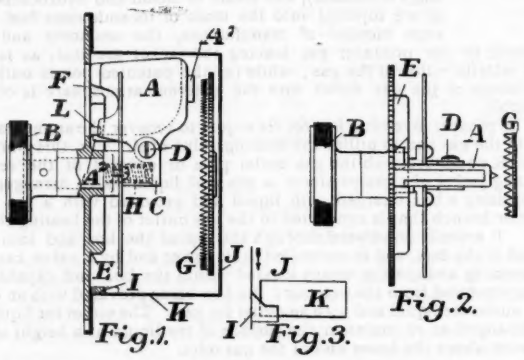
The gas-washing arrangement is constructed as described in patent No. 112,091, and comprises a box H charged with liquid into which a gas inlet pipe I, forming a continuation of the gas outlet pipe G from the chamber B, dips, and through which the producer gas formed during the blowing-up stage can be delivered into the box and below the surface of the liquid therein, so as to become washed by it. K is an inlet for the gas washing liquid, and M is a transverse wall of the weir over which the liquid flows and which serves to maintain the level of the liquid above the lower end of the pipe I. N is an outlet branch through which the washed producer gas is led to the boiler or other plant O—say, a boiler wherein the calorific value of the gas is to be utilized. P is an outlet for the liquid flowing over the wall M. R is a valve for controlling the sealed outlet end of the pipe I. It is pivoted to, and carried by, a lever arm S pivoted at T, and freely jointed at its other end to a rod U extending through a stuffing box at V, whereby the valve can be readily opened and closed at will.

Coin-Freed Prepayment Gas-Meters.—No. 168,467.

YOUNG, E., and METERS LTD., of Manchester.

No. 17,450; June 26, 1920. No. 24,268; Aug. 20, 1920.

This combined invention has for its object to provide means for effecting the operative connection of the coin-carrier with the prepayment mechanism through the medium of the inserted coin, and for the disconnection of the parts and the discharge of the coin from the carrier when the latter has made the predetermined operative movement.



Young's (Meters Ltd.) Prepayment Mechanism.

Fig. 1 is a sectional elevation of the coin-freed mechanism; fig. 2 is a plan of the mechanism with the casing removed; while fig. 3 is a plan of the lower part of the casing.

The coin-carrier consists of a pocket-like part A having one side open. The carrier is pivotally mounted at its closed end upon the axis of the finger grip or handle B, and is provided with an extension at C beyond its pivot D to serve as an abutment for a spring which tends to keep the upper end of the pocket pressed away from the prepayment mechanism. On the inner side of the slotted front plate or disc (which is graduated and arranged for adjustment in any ordinary manner) there is fixed a cam-ring E, such that when a coin is inserted in the carrier, by way of the slot F, the subsequent rotation of the carrier will, at its initial stage, cause the edge of the coin projecting through the open side to engage the inclined or active portion of the fixed cam-ring E. The further movement of the carrier, with the coin, causes the carrier to be swung-over against the action of the spring, so that a lug or tooth-like projection A_1 at the upper end of its closed side is brought into operative engagement with the laterally notched wheel G of the prepayment mechanism and imparts the predetermined movement to it. During this setting movement of the prepayment mechanism, the carrier is maintained in engagement and the coin in position in the carrier by the action of the spring H, which holds the edge of the coin in close contact with the active face portion of the cam-ring.

The discharge of the coin and the disconnection of the carrier is brought about by an abutment piece I fixed to the casing containing the carrier. When the carrier (moving in the direction of the arrow at fig. 3) meets the abutment, it is moved slightly further towards the prepayment mechanism. This movement withdraws or releases the pressure imposed by the spring on the edge of the coin, and so it can fall freely through the mouth of the carrier (now in the inverted or discharge position) and thence descends, through the aperture K, to the receptacle for coins. The further movement of the carrier towards the prepayment mechanism also causes its lug or tooth-like projection A_1 to close still further upon the mechanism it engages, and to act as a check or brake to prevent any over-riding of the mechanism. On the discharge of the coin from the carrier, the spring immediately effects the disengagement of the carrier from the prepayment mechanism.

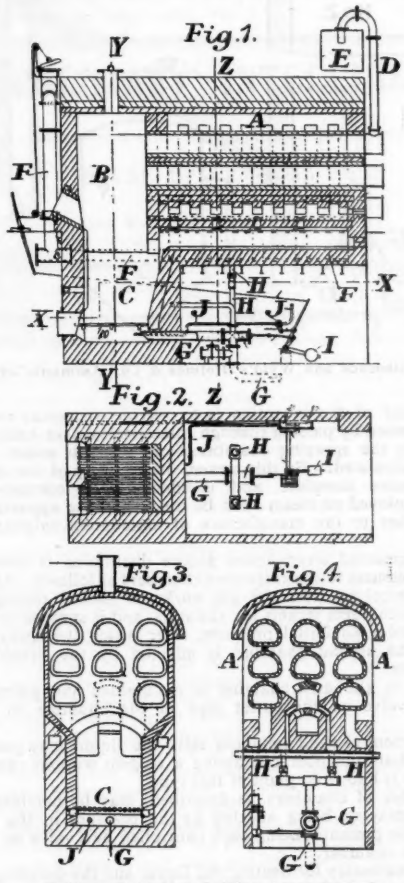
The pivotally mounted carrier A has a projecting tooth or hook-like part A_2 on it, which comes into contact with the lug L upon the front plate, when the carrier is opposite the coin slot F in the front plate, so that a tilting or oscillatory movement of the carrier is prevented when the latter is in this position. Tampering with the prepayment mechanism by means of a tool or instrument inserted in the carrier through the coin slot is thus prevented.

Retorts and Apparatus for the Production of Mixed Gases.—No. 168,535.

ROBINSON, F. H., of Harrogate.

No. 27,966; Oct. 2, 1920.

This invention (relating to the destructive distillation of coal for the production of mixed gases) consists in following the known method wherein the coal is placed for preliminary distillation within a retort from which afterwards the coke or spent coal is ejected into a producer so that the gas rising from the producer may pass through the subsequent charge of coal and mix with the gas therefrom.



Robinson's Retort-Setting Arrangement.

Fig. 1 is a longitudinal sectional elevation of a horizontal retort setting with the several parts in connection therewith arranged in accordance with the invention. Fig. 2 is a sectional plan on line X of fig. 1. Fig. 3 is a front sectional elevation taken on line Y. Fig. 4 is a similar section on line Z.

The retorts are mounted so that the usual heating flues A surround them. However, instead of having both ends of the retorts accessible from the outside of the setting, one end of each retort is made to open into a chamber or space B which leads to, and is above, the generator C. The capacity of the space B relatively to that of the retorts and generators is sufficient to enable it to receive and retain any coal gas that is generated during the blow, so as to prevent it from entering the space surrounding the retorts and escaping with the inert gases from below. The coal is fed through the door-ways at opposite ends to the ends which open into the space B; and by inserting discharging devices through the outer openings, the spent coke is forced out through the other end into the space above the generator to be consumed. The ends of the retorts which open into the space B are always uncovered, while their other ends have the usual doors mounted upon mouthpieces from which uptake pipes D conduct the coal gas or mixed gases into the hydraulic main E. An uptake pipe F has its lower end leading into

the setting, so that inert gases during the "blow" may be conducted away by the uptake and forward to the chimney. A conduit G leads from a blower (which may consist of a fan operated by an engine) so that air under pressure may be supplied through it or may lead from any other source of supply whence air under pressure may be obtained in order that the blast of air may be conducted to, or be delivered beneath, the grate of the generator.

From the same source of supply a current of air is supplied under pressure through the pipes H, so that it may escape through nostrils to supply secondary air for the combustion of gases which may have entered the combustion chambers or flues surrounding the retorts during the preceding "run."

The supply of air to the conduit G and pipes H is controlled through a three-way valve operated by a lever fixed upon a shaft operated in one direction by a weighted lever I. Fixed upon the shaft is another lever coupled by a flexible connecting device to a lever pivoted on bearings fixed upon the floor.

Steam is admitted beneath the grate of the generator through the steam pipe J, on which is mounted a valve coupled by a lever and rod, so that when the attendant moves the hand lever in one direction he opens the air inlet through the pipe G and vertical pipes H, and at the same time closes the valve to shut-off the steam.

When making use of a steam-engine for operating the fan or blower, it is so arranged that when steam is shut-off from the generator a larger volume of it is conducted to the engine in order to cause it to run quicker, and so carry out the blowing operations. When the blowing operations are to cease, the supply of steam to the engine is cut down (only allowing sufficient to keep the engine in motion, in order to facilitate restarting) and the passage to the generator opened-up, so as to commence the "run."

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Oct. 19.]

Nos. 26,689 to 27,455.

ADAMI, F.—"Gas cooking-stove." No. 26,705.
ALFORD, F. E.—"Convertible gas-ring and gas-fire." No. 26,877.
ALLENDER, J. J.—"Gas boiling and grilling devices." No. 26,989.
BROWN, A. G.—"Means for fitting and removing gas-mantles." No. 26,748.
CLARK, A. H.—"Automatic regulating gas-stove." No. 26,757.
CONSTANTINESCO, G.—"Valves." No. 27,032.
CONSTANTINESCO, G.—"Pipe connections." No. 27,033.
CUMBERLAND COAL POWER AND CHEMICALS, LTD.—"Manufacture of hydrogen or gases rich in hydrogen." No. 27,188.
FOX, T.—"Prepayment mechanism for meters." No. 27,008.
JACQUES, A.—See Cumberland. No. 27,188.
PARKINSON AND W. & B. COWAN, LTD.—"Vapour lamps and stoves." No. 27,235.
PELLATT, A. W.—"Producer-gas plants." No. 27,062.
PLUMMER, H. G.—"Joints for pipes, &c." No. 27,327.
RELF, A. G.—See Clark. No. 26,757.
ROBINSON. S.—See Fox. No. 27,008.
SIEMENS-SCHUCKERTWERKE.—"Purifying gas by electricity." No. 27,089.
STOVES, LTD.—See Allender. No. 26,989.
TULLY, C. B.—"Manufacture of gas for heating and lighting." No. 27,074.
WELLS, J.—"Gas-producers." No. 27,182.
WEST, J. H.—See Cumberland. No. 27,188.
WESTLEY, J.—"Fluid-controlling valves and taps." No. 27,226.
WILD, M. B.—"Coal conveyors" No. 27,319.

Price of Gas in Bulk at Hull.—At a meeting of the Hull Corporation Water and Gas Committee, a letter was read from the British Gas Light Company, intimating that the price of gas supplied to the Corporation in bulk, for distribution to consumers in the Old Town, would be increased by 10d. per 1000 c.ft.—*i.e.*, from 2s. 6d. to 3s. 4d. The Sheriff (Mr. J. W. Locking) queried the justification for this increase, when the cost of labour and materials was falling; but the Gas and Water Engineer pointed out that the increase was based on the cost of gas to the Company for the last two years, during which time they had not charged what they might have done. The figures showed that the Company were entitled to the increase. The Sheriff, however, pressed his objection; and a Special Committee was appointed to approach the Streets and Electricity Committees, with the object of inducing them to further extend the public lighting by electricity to the Old Town.

Automatic Lighting in St. Pancras.—The Lighting Committee of the St. Pancras Borough Council recall that at their last meeting they reported that half the automatic light controllers had been installed, and, as the completion of the work would have meant the displacement of further labour, instructions had been given that it should not be completed until labour conditions were more favourable. The report was, however, withdrawn for the matter to be reconsidered. Now the Committee report that the installation of the first half of the controllers resulted in thirteen men being discharged, who were subsequently placed on part-time work, while nine men remained on full time. The part time men were also further employed on painting work to supplement their wages; but this had to be abandoned to avoid any dispute with the Trade Unions concerned. It has now been decided that the installation of the controllers shall be completed; and, by agreement with those men who remained on full time, a more equitable distribution of the work has been arranged, so that each man works 40 hours instead of 47 hours per week. This re-arrangement involves an additional cost in wages of approximately £13 per week as compared with the period when a portion of the men were on part time. Against this, however, there will be an approximate saving of about £5 per week in gas, due to the installation of the controllers and improved burners.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" of applications by gas undertakings to the Board of Trade for Orders under section 1 of the Gas Regulation Act.

Brynmawr and Blaina Gas Company.

The maximum price now authorized in respect of the supply of gas by the undertakers is 6s. 6d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 2s. 3d. per therm.

Northfleet and Greenhithe Gas Company, Ltd.

The standard price now authorized in respect of the supply of gas by the undertakers is 4s. 9d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 2s. 2·7d. per therm.

DECLARATIONS OF CALORIFIC POWER.

Godalming Gas and Coke Company, Ltd.—500 B.Th.U. (Dec. 23.)
South Normanton and Blackwell Gas Company, Ltd.—450 B.Th.U. (Nov. 10.)

SPECIAL ORDER.

Croydon Gas Company.

The Company give notice of their intention to apply for a Special Order under section 10, including various financial provisions; to allow of the holding of annual meetings; to regulate the price of gas; to make provision for the use of back-pressure valves; and for other purposes.

GAS REGULATION ACT ORDERS.

The Director of Gas Administration has forwarded copies of the following further Orders made by the Board of Trade under section 1 of the Gas Regulation Act.

Andover Lighting and Power Company.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 16·8d. per therm.

For the purpose of ascertaining the authorized rate of dividend for the half year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the half year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by five. (Oct. 20.)

Earby and Thornton Gas and Lighting Company, Ltd.

After the declared date—(*a*) The standard price in respect of gas supplied by the undertakers shall be 17·2d. per therm; (*b*) 16·6d. shall be substituted for 3s. 9d. in section 14 (price of gas with sliding-scale as to dividend) of the Earby and Thornton Gas Order, 1908.

For the purpose of ascertaining the authorized rate of dividend for the year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by five. (Oct. 20.)

Queenstown Gas Company.

As from the declared date, the maximum price in respect of gas supplied by the undertakers shall be 25·4d. per therm. (Oct. 19.)

Riddings District Gas Company.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 16·4d. per therm.

For the purpose of ascertaining the authorized rate of dividend for the half year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the half year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-one-third.

Prepayment meter clauses are included. (Oct. 17.)

STANDARD DECLARATIONS BY GAS COMPANIES.

An example of the interest which is generally taken in the declarations of calorific power made by British gas undertakings under the provisions of the Gas Regulation Act is to be found in the following extract from the September issue of the Information Service of the American Gas Association.

The British Gas Regulation Act, passed about a year ago, gave to the Board of Trade the power to permit gas companies to declare the quality of gas they could best supply, and to substitute for the existing standard or maximum price a standard or maximum price for each 100,000 B.Th.U., known as "a therm."

On June 30, 57 heat-value standards had been declared under the terms of the Act. Of this number—

1 company	selected	550 B.Th.U.	8 companies	selected	470 B.Th.U.
1 company	,,	540 ,,	4 companies	,,	460 ,,
7 companies	,,	500 ,,	19 companies	,,	450 ,,
1 company	,,	490 ,,	2 companies	,,	425 ,,
7 companies	,,	480 ,,	1 company	,,	420 ,,
5 companies	,,	475 ,,	1 company	,,	400 ,,

The average for all was 467 B.Th.U. Fifty-one of the 57 companies selecting new standards, or 94 p.ct. of the total number, selected values between 450 and 500 B.Th.U.

WOODALL-DUCKHAM VERTICALS AT TROON.

The inauguration took place on Tuesday of last week of an installation of eight Woodall-Duckham vertical retorts which has been erected at the Troon Corporation Gas-Works, at a cost of £36,000. Provost Muir, who is Convener of the Gas Committee, officiated at the ceremony, which was carried through in the presence of a large number of gas engineers, burgh officials, and others. Among those who attended were Sir Arthur Duckham, K.C.B , and Sir Alexander Walker, K.B.E. Following upon the formal inauguration, the company proceeded to the Marine Hotel, where luncheon was served. The Loyal Toast having been honoured,

Sir Alexander Walker, submitting the "Troon Corporation Gas-Works," said he was convinced, from what he knew of other works, that Troon had made another march in the application of science to the economy of production in one of the foremost necessities of the day, and that was cheap gas. He was convinced that the community would be much better served than under the old system. The use of gas for cooking was undoubtedly growing very rapidly; and he was sure that, with the new plant, and, no doubt, the diminished cost, there would be another big fillip given to the movement for the use of gas for heating and cooking, which would ultimately cover the whole field, especially on the domestic side of consumption. Personally he was exceedingly well satisfied with what he had seen that day. As a councillor of 25 years ago, he was slightly responsible for the original purchase of the works; and he certainly had not been satisfied they were getting a very good bargain. But corporations had always to buy such works at an enhanced price.

Provost Muir, in acknowledgment, said this was undoubtedly another red-letter day in the history of the undertaking. The gas-works had been taken over in 1898; and at that time they were almost derelict. The output was between 6 and 7 million c.ft., and the purchase price £6800. Immediately on taking over the works, they had gone in for an extension, which cost £13,000. A few years ago they had come to the end of their tether as far as the present works were concerned; and the matter was gone into carefully to see what could be done. Unfortunately that had been during the war, when everything was at a phenomenal cost; and they had been a little afraid of venturing on a large scheme of putting in an entirely new set of vertical retorts. But though the new installation had cost a considerable amount of money, it would, he felt sure, more than pay the interest on the expended capital. It was an excellent job in every way. He had never seen better workmanship than that put into these retorts; and those who had superintended the work had expressed themselves thoroughly satisfied that it was really the finest small setting they had had to do with.

Mr. George Keillor, of Greenock, proposing the "Woodall-Duckham Company," said if he had been submitting the toast to a company of gas engineers, who were conversant with the firm's character, and their business methods, very few words would have sufficed to commend it to them. But in submitting the toast for the acceptation of the Town Council and other public representatives, not so conversant with the firm, it became necessary to explain briefly why it was that the contractors were held in such high esteem. First of all, it was because they had a good article to sell. Secondly, the contracting firm were absolutely dependable. They believed in fair dealing, and they did not quibble over trifles. In the capable hands of the Manager (Mr. M. C. MacFie) the installation ought to prove an immediate benefit to the public at large.

Sir Arthur Duckham, replying, said that, as a business proposition, it paid to be honest. He had always told their friends, or their clients, that it was a second order he wanted. This was the principle they had tried to work on. Regarding the Troon installation, he would like to tell them that, while it was not a big one, it had been one of the most difficult they had ever had to consider. It had given them great food for thought to find the best way they could get a really good installation into the small space that was available, without interfering with the existing plant. He thought the new installation was as good as any that could be put into the position, and that it was as satisfactory as it could be. He handed the Provost a memento, to mark the opening of the plant. The Provost had taken much interest in the erection of the plant; and he had technical knowledge. He asked him to accept a silver cigarette casket, bearing an appropriate inscription.

Provost Muir returned thanks for the memento, which he said would be prized very highly.

BIRMINGHAM GAS DEPARTMENT AND THE COAL STRIKE.

In a report to the Birmingham City Council for their meeting on Tuesday of last week, the General Purposes Committee gave details of the measures taken to secure fuel and light control during the thirteen weeks of the mines' stoppage. They pointed out that the control of gas supplies caused a considerable amount of work, for large numbers of firms had to be interviewed, the circumstances of their works, manufactures, and resources considered, their relative importance to other industries weighed, and the allowance of power to be made decided upon.

Dealing with the work of the Gas Department, the Committee stated that the weekly tonnage of coal required normally for carbonization varies from 22,000 tons in the winter months to 13,000 tons during the summer. At the commencement of the strike, the reserve stock of coal at all the works amounted to approximately 90,000 tons; and, in addition, gas oil to the extent of about 900,000 gallons was in stock for the manufacture of carburetted water gas. These stocks were sufficient to meet the then rate of consumption for a period of six weeks. In the absence of house coal supplies, a majority of the inhabitants of the city were dependent almost entirely on gas-stoves for cooking; and the Gas Committee were, therefore, from the commencement of the stoppage, strongly of opinion that the supply of gas should not be interrupted, if this could be possibly avoided—bearing in mind also the effect upon the working of factories and the increase in the number of the unemployed which would follow a cessation. On April 3, the Board of Trade issued their Coal Emergency Directions, instructing gas undertakings throughout the country to conserve their coal and oil stocks to the utmost, and at the same time restricting the use of gas by factories and business premises to 50 p.ct. of the pre-strike consumption.

A normal gas supply was maintained for a period of five weeks; and as there was then no indication of an early return to work at the pits, the gas supply was, on the instructions of the Emergency Committee of the City Council, restricted between the hours of 2 and 4.30 p.m., and 6 and 9 p.m. The measure was brought into operation from May 4 and was effected, as in the coal stoppage of 1912, by reducing the pressure at the gas-works during these hours to a minimum consistent with safety. Early in June the stocks of coal at the gas-works had diminished to such an extent that it became imperative, if the supply to the city were not to be discontinued entirely, to obtain coal from abroad. Negotiations were made through the Government Agents; and, in all, five cargoes of American gas-making coal, amounting to approximately 20,700 tons, were purchased. When the first consignment arrived, practically the whole of the original stock of coal at the gas-works was exhausted; and from that time until the end of the dispute the maintenance of the gas supply was dependent upon the uninterrupted delivery of the American coal.

During the early days of the trouble, the department was able to give good supplies of coke to householders, manufacturers, bakers, hospitals, and the other essential services of the city; but as the stock of coal diminished, sales of coke had to be regulated. In the latter stages of the dispute, it was necessary entirely to cut off supplies, with the exception of limited quantities to bakers, as practically all the department's production was required for the manufacture of carburetted water gas.

During the period of the stoppage, the output of gas showed a decrease compared with the corresponding period of the previous year of 667 million c.ft., equal to about 23 p.ct.

The effect of the stoppage upon the finances of the Department was extremely serious. It is estimated that the total loss sustained by the undertaking, due solely to the cessation of work in the coalfields, was no less than £140,000.

GAS OR ELECTRICITY FOR HOUSING SCHEMES.

Further Reports from Glasgow.

Some months ago, the Glasgow Corporation decided upon sending a deputation to visit Billingham and London to see all-gas and all-electric housing estates. This followed upon reports which were noticed in the "Journal" for July 13 last [p. 111]. The deputation have since reported upon their visits.

From Newcastle they went to Billingham, near Stockton-on-Tees, to see the all-electric housing scheme there. This scheme comprises 73 semi-detached houses, of which 60 are now in occupation. The houses are all to be occupied by the employees of the Newcastle-upon-Tyne Electric Supply Company, who supply the electric current to be used in heating and lighting the houses, and also for all cooking purposes. There is, however, provision for one coal-fire in the living-room, with the usual boiler attached for heating water, and another in the bedroom above the living-room. The utilization of electricity for heating the other bedrooms, cooking, ironing, and lighting is made practicable by reason of the small charge for current. It is supplied at 250 volts pressure, at a charge of one-farthing per unit, *plus* a standing charge of £5 per annum to each tenant. The average consumption per tenant per annum was stated to be 3500 units, so that the yearly cost (including the standing charge) for electric current per house will be £8 13s. The tenants are well satisfied with the results, and aver that cooking in the electric stove is more dependable than cooking in a gas-stove, and the regulation of the heat is more easily accomplished.

Later they visited the housing schemes at Woodford and Becontree in the area east of London, accompanied by the Architect (Mr. Beckett). The houses at Woodford—150 in number—are to be heated and lighted by gas, the lamps in the living-rooms being of 80 c.p., and those in the bedrooms and scullery of 50 c.p. The cost of the gas is 5s. 6d. per 1000 c.ft., which includes a charge of 10d. per 1000 c.ft. for installing the mains, piping, cookers, &c. Twenty gallons of hot water from the boiler behind the living-room fire can be brought from 105° Fahr. to boiling-point by gas in the copper for the sum of 2d. Seven hours' burning of the gas-lamp in the living-room would cost, they were informed, 1d.

They were then conducted over the Becontree Estate in the same district, where it is proposed to build 3000 houses. All these are also to be supplied with gas for lighting, heating, and cooking. The gas-mains and all fittings will cost £22 per house.

Crossing over the Thames, they were taken over the housing scheme at Barking. They were informed that the District Council, though they possess electricity works of their own, have come to the conclusion that gas should be utilized in all their houses, and that no coal or electricity should be employed for heating, lighting, or cooking. On visiting one of the occupied houses, the tenant informed them that the cost of gas to her for all purposes was 5s. per week, or at the rate of £13 per annum.

The next visit was to the neighbouring scheme in the Eltham district. Here, as in Billingham, there is a coal-fire in the living-room. For lighting, cooking, heating, &c., each house is fitted with ten points or switches—namely, five for lighting, one for an iron, one for the oven, two for boiling-grids, and one for the grill. The electric stove cost £14 15s. complete, and each point cost £1 9s. 6d. It was stated that, if the average consumption of electrical current for a year in each house came to 1500 units, the Council could supply it profitably. On the average, each tenant consumes only 21 units per week, at a

cost of 4s. 4½d. The current is therefore costing 2½d. per unit. Mr. Sheridan (the Council's electrical expert) informed them that the local Gas Company had offered to the Ministry of Health to instal all-gas fittings free of cost, and that the Ministry had asked that the houses be all-gas ones. But his Council had resolved to make them all-electric, though the subsidy would not be paid on this. They were entertained at tea in one of the houses at Eltham, where all the eatables had been cooked in the electric stove just before their arrival. Here the woman cook answered many questions put to her by members of the deputation, and appeared quite confident that the electric-stove was in every respect more serviceable and more cleanly than a gas-stove, as there were no fumes and no dirt of any kind. Apart from the costs as between gas and electricity for heating and cooking purposes, they were convinced that no difficulty need be experienced in installing and operating an electrical plant for household purposes.

The deputation's report proceeds: The question as between the advisability of installing in any housing scheme gas or electrical current for all purposes, is one not easy to answer, if consideration of economy is to be taken seriously into account. It was fairly manifest to us that, in point of utility, convenience, cleanliness, and freedom from fumes, as well as chances of accident, the tenants who were occupying the all-electric houses were unanimous that electricity was to be preferred, and probably many of them would be prepared to pay something extra for the advantages electricity confers. On the other hand, it does not seem to be able to compare favourably in cost with gas at present, as is shown from figures supplied to us by the representative of the Newcastle-upon-Tyne Electric Supply Company. They put the average consumption of electrical current per house per annum at 3500 units, which, at ½d. per unit (flat-rate), costs £7 5s. 10d. If, in addition to this charge for current, there has to be paid (as at Billingham) an overhead charge by each tenant of £5 per annum, this adds 0·343d. per unit, which makes the total charge per unit of electric current used 0·843d. We were informed during our inspections that there are 3880 B.Th.U. in each unit of electrical current; and also that in a cubic foot of gas there are 540 B.Th.U. On these data it will be seen that, in order to bring the price of electric current equal to gas in respect of the heating power of each element (gas costing 4s. 7d. per 1000 c.ft.), the unit of electricity would require to be reduced in price to 0·395d., instead of the 0·843d., which would have to be paid by the tenants at Billingham if ½d. per unit were charged, instead of ½d. Notwithstanding this, we are convinced that many tenants would not grudge the extra expense which would be incurred for an electric installation in their houses, both for lighting and cooking. While we still are of opinion that electricity for lighting and gas for cooking should be supplied to our housing schemes, we are also convinced that an all-electricity supply or an all-gas supply is quite feasible, and might be tried in one of our schemes. The matter of cost must, however, be carefully gone into.

[A comment on this report appears in our editorial columns.]

BRISTOL AND ITS GAS SUPPLY.

The Bristol and South Wales Section of the Society of Chemical Industry opened its fourth session on the 7th inst., when Mr. R. Robertson read a paper on "The Gas Industry," in which he gave some particulars as to the history of gas supply in Bristol.

This history, he said, dates back to 1811; while to-day the Bristol Gas Company has a total capital of £1,900,000, has 72,700 consumers, disburses £200,000 per annum in wages, and pays £27,000 in rates and taxes. The raw materials used—namely coal and oil—were dealt with; and the difficulties arising from variations in the ash-content of different coals were emphasized—the compulsory sale of coal upon a thermal basis being strongly recommended.

Interesting details were given (and lantern slides were shown) of the various carbonizing systems, together with purification and the recovery of bye-products. The various methods of measuring and testing gas, together with systems of storage and distribution, formed a very interesting section of the paper; the distribution system of the Bristol undertaking being used as an illustration. From each of the three works, trunk mains radiate towards different parts of the city; and these are linked up at frequent intervals—thus forming a huge arterial system consisting of about 400 miles of mains having a total capacity of almost three-quarters of a million cubic feet.

A difficulty which has to be faced in Bristol is the fact that demands made upon local mains and services have grown to an extent undreamt of even a few years ago; and this has been aggravated by the fact that the design of services and the carcassing of houses have been left to private enterprise frequently more concerned about economy than efficiency. This difficulty is being overcome by the introduction of a high-pressure feeder system with extensions in various directions.

Combustion and the uses of gas were then noticed, and finally the all-important question of coal conservation—a matter of more technical or even commercial interest, and one of vital national concern. Making all due allowance for exceptional national genius, the author said our position as a nation is the result of a plentiful supply of cheap coal. When this is no longer available, England can no longer be the workshop of the world; and the sentimental bonds of Empire will not avail her in the competition without cheap fuel. The various inquiries which have recently been instituted by Government Departments form a welcome sign that the national conscience is awakening. One of the facts which emerges from these inquiries is that the burning of raw coal in open grates is, from the national point of view, both wasteful and harmful. The consumption of domestic coal in the United Kingdom is about 40½ million tons, of which about 34 million tons is wasted, together with valuable bye-products. In addition to this appalling waste, 6 p.c. of the total coal, or 2,430,000 tons, escapes into the atmosphere as soot; and the effects upon property, vegetation, and the national health call for drastic and immediate remedy. It is safe to say that no other process can compare as a

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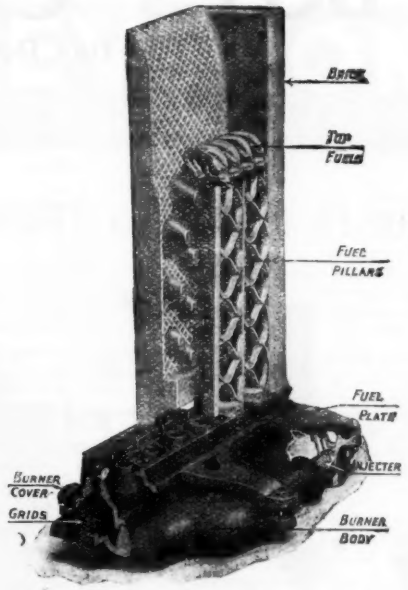

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remedy with the carbonization of coal. The average thermal efficiency of ordinary carbonizing plants is estimated at not less than 75 p.ct., and on this basis the whole of the heating now done by the 40¼ million tons of domestic coal could be accomplished by the use of 16 million tons if carbonized according to the best modern practice. Compared with this, the results to be obtained from the super-power stations recommended by the Sub-Committee of the Commission on Coal Conservation would require 42 million tons if this, in turn, assumes a degree of efficiency which can only be hoped for by the gasification of low-grade coals in producer-gas plants.

COKE AS A MOTOR FUEL.

At a Special Meeting of the Institution of Automobile Engineers at Olympia, last Thursday, in connection with the Commercial Motor Vehicle Exhibition, Mr. Thomas Clarkson read a paper on "Coke as a Fuel for Commercial Vehicles."

After making comparisons between the approximate B.Th.U. obtainable for 1d. from various forms of liquid fuel, coal gas, coal, and coke, in which it was shown that coke gives 74,000 B.Th.U. for 1d., on the basis of a price of 30s. per ton (which is considerably higher than any other of the fuels taken for comparison purposes), Mr. Clarkson said it was important that coke should be broken to fairly uniform size for use as a motor fuel, the maximum size being 2 in., and the minimum ¾ in. It was important, too, from the user's point of view, that the coke should be as dry as possible. If moist coke was fed into a cold boiler, the trace of sulphur in the coke, when burnt, combined with the wet surface of the steel forming dilute acid, which rapidly corroded the steelwork. Mr. Clarkson then outlined some of the more recent developments in steam-driven vehicles of his design, with coke as a fuel. In these a boiler is used. Another application of coke as a fuel for commercial vehicles is in portable gas-producers, which have been fitted to motor vehicles; but, said Mr. Clarkson, while the gas-producer on a large scale is accepted as an efficient appliance, producers of the small dimensions required for use on motor lorries necessarily lose some of the advantages possessed by their big brothers.

The conclusions he arrived at were that petrol at 2s. 4d. per gallon cost 4d. per vehicle-mile when operating a 3-ton lorry at 7 miles per gallon; steam cost 1d. per vehicle-mile; and a gas-producer cost about two-thirds of a penny per vehicle-mile. Adding the extra cost of maintenance of the producer and engine, he was convinced the net result would show a substantial balance in the cost of operation to the credit of an up-to-date steam vehicle, using coke as a motor fuel.

DISCUSSION.

In the course of a long discussion which followed the reading of the paper, several users of steam vehicles complained of the poor quality of gas coke now generally obtained. Others complained of the variation in quality, which on one occasion was said to be so low as to give no power at all; while at the other extreme was mentioned a case in which the coke was of such good quality as to be almost comparable with a Welsh coal.

Mr. R. C. Macdonald (South Metropolitan Gas Company) said that there were many misconceptions in the minds of those who had not had experience in the use of coke for steam-raising. One of the most common was that it had a detrimental effect on the life of the boiler. In this connection, he instanced a fleet of twenty-four locomotives at one of his Company's works. A few years ago ordinary bituminous coal had been used to fire them, with the result that the boilers were a continuous source of trouble, due to leaky tubes and fireboxes. Welsh coal was substituted, with beneficial results. But during the last coal strike this had to give way to coke; and during the time coke had been in use, they had been particularly immune from boiler trouble, and had not experienced any difficulty in maintaining a constant head of steam. He also described a six-weeks' trial carried out by his Company on a 3-ton Clarkson lorry. This was used for the delivery of coke in small quantities, involving numerous stops and delays. The cost was about one-third of that for a petrol vehicle carrying the same load, under exactly the same conditions. With regard to the use of gas coke on portable producers, they had carried out a number of experiments last year with coke on a Smith producer; but the results were unsatisfactory. It had been found that a good quality of gas was produced much quicker than with anthracite, but that it fell in value very rapidly. From the figures, it appeared that the depth of the fuel bed was insufficient. In the case of the Parker producer, which was fitted to an Albion lorry, better results were obtained, and on two consecutive days a run of 50 miles with a load of 3 tons was accomplished in six hours; but the power developed on hills was very poor, and it was found impossible to keep the speed of the engine down when standing. The fuel consumption worked-out at 1¾ lbs. per mile. On the regular work, which entailed so much stopping and starting, this producer had proved a failure up to the present. The proposition, however, appeared to be an attractive one; and they were hopeful that the difficulties would be overcome.

Mr. E. W. L. Nicol (Engineer and Fuel Expert to the London Coke Committee) said that from almost every view-point, the comparison drawn in the paper between the different fuels—solid, liquid, and gaseous—was quite obviously and naturally in favour of coke; and, having regard to these advantages, it was surprising that designers generally had not hitherto made due provision in order to facilitate its use as fuel for motor transport vehicles. Among numerous other important factors in favour of coke was its wide distribution and availability as compared with other fuels. It was, he believed, produced at some 1600 gas-works up and down the country, at each of which it was available in suitable form for use in steam-wagons. With regard to moisture in coke, the author had raised a doubt in the mind of prospective users which long experience certainly did not appear to warrant. Moisture in fuel was, of course, objectionable in any form; and in combination with sulphurous gases, it might indeed, in certain cir-

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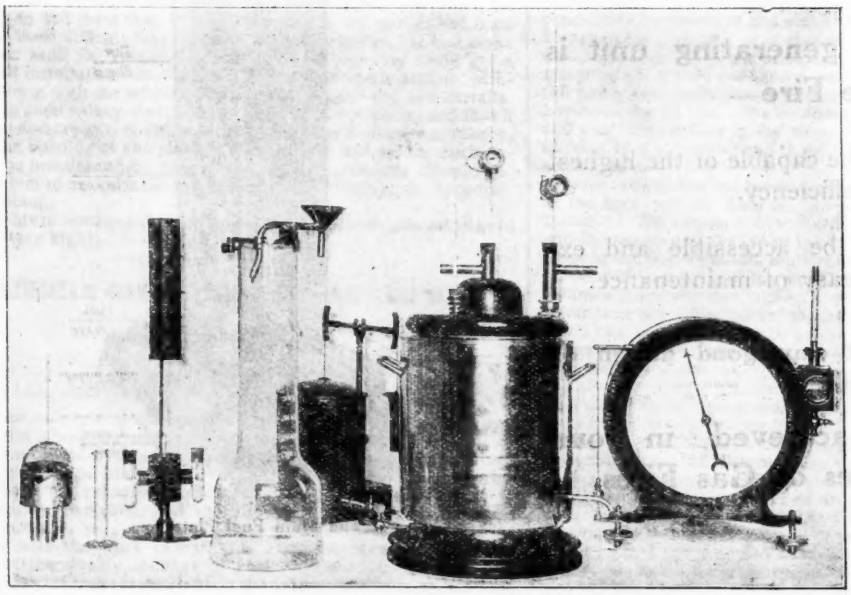

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cumstances, be harmful in contact with metal boiler plates and fittings. In the process of coal carbonization, however, which was carried on at a temperature of about 2000° Fahr., practically all the volatile sulphur was driven off in the gaseous and liquid products. Coke, therefore, contained a minimum of volatile sulphur, and certainly less than coal, from which the baneful effects described by the author did not as a rule appear in practice. Furthermore, the very large extent to which coke was now used at power stations for transport services—such as tramways and electric railways—did not warrant any fear whatever as to its economic utility for steam raising. Official tests made by the London County Council showed that the average moisture content in a delivery of over 25,000 tons was about 5 p.ct., and the ash content 10 p.ct.

Lieut.-Col. D. J. Smith said that the distillation of coal was being strongly urged as a means of providing liquid fuels; but the coke remained, and must be used. The disposal of the coke had been a problem with more than one gas company recently; and it was surprising that the automobile industry did not do more to utilize this source of cheap, satisfactory, and home-produced fuel. Mr. Clarkson had been a little hard on gas-producers. While coke could be used for vehicle propulsion in a gas-producer, it was not a fuel which would be run after if any other were available. The main consideration, however, was that there was available an unlimited quantity of home-produced solid fuel suitable for vehicle propulsion; and in the present impoverished state of the country it did not seem fitting to import millions of pounds worth of liquid fuel when this home-produced fuel was available. There were two qualities of coke—foundry coke and gas coke. Foundry coke was an extremely satisfactory fuel, either for Mr. Clarkson's vehicles or in a gas-producer; but the general run of gas coke was very variable. If it were delivered with any large percentage of moisture, it was no use for gas-producer work. It might be thought that the moisture in the fuel would furnish the hydrogen content for the gas; but this was not so. Any moisture put into the producer with the fuel had to be driven off, with loss of efficiency and a lowering of the thermal value of the gas, and consequent troubles in the engine. With foundry coke these difficulties were not experienced. The natural troubles with gas coke would not affect Mr. Clarkson nearly so seriously as they would the producer; and makers of producers for stationary work did not recommend coke—and especially gas coke—if any other form of fuel was available.

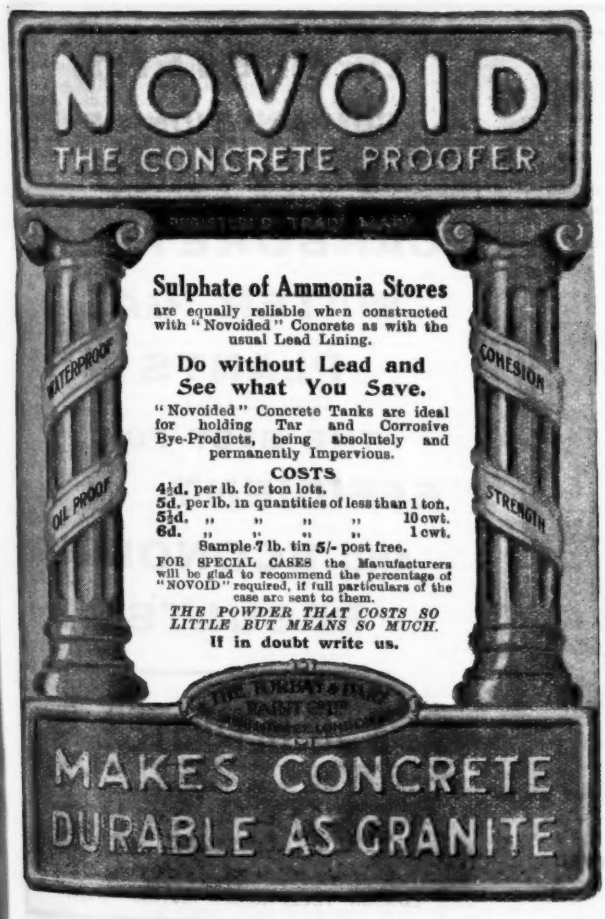
Mr. G. M. Gill (Chief Engineer to the South Metropolitan Gas Company) emphasized the great importance of getting clean coal. All coal and coke users knew to their cost how very much dirtier coal was nowadays than before the war; and, after all, the dirt in the coal had to come out in the coke. So that, if good coke was to be obtained, it was very largely dependent upon what they did at the collieries. The South Metropolitan Company bought 1¼ million tons of coal per annum, and had found it necessary to have a manager in the North of England, with a laboratory and a staff of inspectors, to take samples of all the coal as it was loaded into their own ships. The samples were then taken to the laboratory, an analysis was made, and this was telegraphed to London—the information arriving before the coal. He did not believe that the collieries themselves had this information. They really did not know what coal they were sending away. In America, however, things were very different. The collieries there knew exactly what they were supplying. The coal was divided according to analysis; and customers knew what they were buying. This struck at the root of the quality of the coke. Gas companies were dependent upon the coal they bought, and had to take what they could get in this country. Burning coke in a grate, whether in a producer or under a boiler, they had a fuel of which the great bulk was fixed carbon—probably about 80 p.ct.—and this enabled them to regulate the air supply to a nicety, whereas with coal they had, perhaps, anything from 10 to 30 p.ct. or more volatile matter, which was constantly changing, so that really the air supply should be regulated minute by minute. Many coke users did not seem to understand that they could cut down their air very much more than with coal. They got a higher efficiency of combustion; and in this way one B.Th.U. in the form of coke was worth more to the user than a B.Th.U. in the form of coal. In addition, of course, it was smokeless. Lt.-Col. Smith had spoken of a producer which had been tested at the South Metropolitan Company's works. The tests were carried out under the supervision of Mr. Macdonald, who had told him that the coke was specially selected, and was the best that could be obtained for the purpose; so that he could only suggest that the producer was designed for fuel other than coke. If they were going to use coke, they must have an apparatus designed for it.

TRADE NOTES.

[For "Journal" Advertisers.]

Spencer-Bonecourt Specialities.

Under the title of "Modern Steam Generation," a new catalogue has been issued by Messrs. Spencer-Bonecourt, Ltd., of Parliament Mansions, Victoria Street, S.W., in which are to be found described boilers for all sorts of purposes, for gas and other kinds of fuel. In the first section, there are dealt with the "Spencer-Hopwood" patent water-tube vertical boilers; and in the second, the Kirke patent fire-tube boilers, for waste-heat recovery and for gas, oil, or coal firing. With regard to the latter, the early work of Prof. W. A. Bone, D.Sc., F.R.S., in collaboration with the late Lieut. C. D. M'Court, is referred to. It is then explained that for some years the name "Bonecourt"—a combination of the names Bone and M'Court—was retained; but, along with the subsequent tackling by Mr. P. St. G. Kirke, M.A., Assoc.M.Inst.C.E., Assoc.M.Inst.Mech.E., of the different problems presented, to prevent confusion and misunderstanding the name "Kirke" has been adopted for the modern boilers, in which are to be found no features of the original type. "Kirke" boilers possess numerous advantages—first of which is placed a maximum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6d. " " " " 1 cwt.
Sample 7 lb. tin 5/- post free.
FOR SPECIAL CASES the Manufacturers will be glad to recommend the percentage of "NOVOID" required, if full particulars of the case are sent to them.
THE POWDER THAT COSTS SO LITTLE BUT MEANS SO MUCH.
If in doubt write us.
WATERPROOF
OIL PROOF
COHESION
STRENGTH
THE TORBAY & DART PAINT CO. LTD
MAKES CONCRETE
DURABLE AS GRANITE

EVEROK
THE WATERPROOFER
FOR
DUSTY CONCRETE FLOORS
is a colourless solution which imparts a smooth, sanitary, dust and damp-proof effect to an otherwise brittle and porous surface, setting as hard as a rock yet retaining its elasticity.
The concrete dust nuisance is even more serious than the porosity of concrete, for the slightest mechanical friction produces an annoying and insanitary dust, which becomes a serious menace to health, as these concrete "atoms" are full of microscopical crystals of silicate from the crushed stones, which inflame the mucous membrane of the throat and nasal organs, and are also very injurious to fine machinery.
'Everok' knits the "atoms" together and forms a hard coating that actually becomes an integral part of the conglomerate, especially if applied to a freshly laid surface.
The covering capacity ranges from 20 to 60 yards super. per gallon, according to the density and condition of the material to be protected.
ONE PENNYWORTH OF 'EVEROK' WILL SAVE A POUND OF TROUBLE.
THE TORBAY & DART PAINT COMPANY, LIMITED,
26-28, BILLITER STREET, LONDON, E.C. 3.

efficiency of over 90 p.ct. Other points are minimum space occupied, low capital cost, and quick steam raising. A number of coal gas, coke-oven gas, and producer-gas fired boilers are illustrated; and there is a photograph of two "Kirke" patent waste-heat boilers for generating steam from hot products of combustion at 500° C. discharged from vertical gas-retorts. There is also a combined waste-heat and gas-fired boiler, the central group of tubes of which are for generation of steam from hot waste products of combustion, and those at the sides for firing with gaseous fuel.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *Oct.* 25.

There is very little of interest passing in the London tar products market. Shipments of pitch, of course, have started for the season, and makers are fairly well sold. It is understood the price remains at about 62s. 6d. per ton f.o.b. steamer at makers' works. Creosote for large quantities in bulk could probably be purchased at a shade under 9d. per gallon net.

The market for sulphate of ammonia for export is slightly improved. There are a good many inquiries on the market.

Tar Products in the Provinces.

Oct. 24.

The average values for gas-works products during last week were: Gas-works coal tar, 50s. to 54s. Pitch, East Coast, 60s. to 62s. 6d.; West Coast—Manchester, 52s. 6d. to 55s.; Liverpool, 52s. 6d. to 55s.; Clyde, 52s. 6d. to 55s. Benzole 90 p.ct. North, 2s. 4d. to 2s. 6d.; crude 65 p.ct. at 120° C., 1s. 11d. to 2s. naked at makers' works; 50-90 p.ct., naked, North, 2s. 4d. to 2s. 6d. Toluole, naked, North, 3s. to 3s. 1½d. nominal. Coal tar crude naphtha in bulk, North, 11d. to 11½d. Solvent naphtha, naked, North, 2s. 8d. to 2s. 9d. Heavy naphtha, North, 2s. 7d. to 2s. 9d. Creosote, in bulk, North, liquid, 8d. to 8⅜d.; salty, 7⅞d. to 8¼d. Heavy oils, in bulk, North, 10½d. to 11½d. Carbolic acid, 60 p.ct., 1s. 6d. Naphthalene, £20 to £30; salts, £7 to £9, bags included. Anthracene, "A" quality, 8d. to 10d. per minimum 40 p.ct.; "B" quality, nominal.

FROM A MARKET CORRESPONDENT.

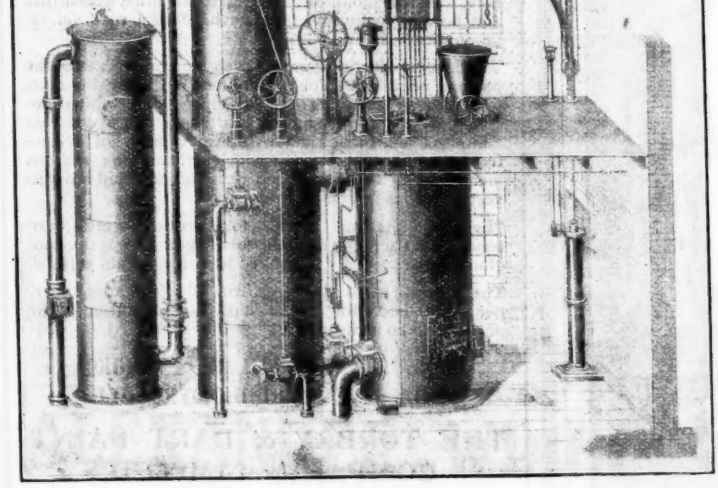
Bye-Products Trade.

Business continues very quiet, without any particular change in quotations. The South Wales consumers of pitch are not interesting themselves in this market, as they appear to be well engaged in working-off deliveries under old high-price contracts. There is not much demand, and prices now range from 55s. to 60s. per ton. There is practically no movement in naphthalenes; refined remaining at £18 to £20 per ton, and crudes from £5 10s. to £8 per ton. Curiously enough, the fire-lighter industry is not buying very much at the moment. There is a good demand for solvent naphtha; and everything that is produced can be readily sold. The present output, however, is a comparatively small one; and as soon as works are going again, it is difficult to see how the current price of 3s. per gallon is to be maintained—this is three times the pre-war price. If the demand continues and there is no material increase in supplies, higher prices are, of course, quite possible; but there is a good deal of forward selling at the moment, and the trade is not looking for any further advance. The price for carbolic acid still does not pay to extract it, although one might have expected that by this time the decrease in output would have brought prices on to a paying level. Creosote is a steady market at 8d. per gallon. There is no great supply at the moment; but with any increased output it is difficult to see how prices are to be maintained. Benzole, 90 p.ct., is steady at about 2s. 9d. to 3s., and pure benzole at 3s. 3d. to 3s. 6d. per gallon, on rail. The price of benzole in Germany is reported on Oct. 5 as follows: Marks 6000 per metric ton, net weight. The price hitherto was marks 5000, at which price deliveries of September permits are to be invoiced, even if such deliveries are made after Oct. 5. Intermediate products have been quiet since my last report, and buyers are only taking sufficient to cover their immediate needs. Not much foreign business is passing; but inquiries are fairly plentiful. Aniline oil and salt are firm at last rates, and export inquiries have been received for both these materials. Salicylic acid is in better request, although no change in quotations is yet to be noticed. Resorcin is a fair market, and anything offered at the price of 5s. 6d. is quickly taken up. Beta-naphthol is quiet at 2s. 6d. per lb.

Sulphate of Ammonia.

Production continues on a small scale, and everything available is readily placed. The British Sulphate of Ammonia Federation announce a further increase in prices as follows: For November delivery, neutral quality in fine friable condition, free from lumps, containing 25¾ p.ct. ammonia, £15 8s. per ton; ordinary quality, containing 25¼ p.ct. ammonia, £14 5s. December prices are 5s. additional on those given above, delivered in 4-ton lots carriage paid to farmers' stations. A very fair export trade is being done at £16 10s. per ton, and inquiries from France give hopes of good development in this direction.

The electricity supply at Keighley failed twice last Saturday evening, causing considerable inconvenience and difficulty throughout the town. The first breakdown occurred about 6.45 p.m.; and it was nearly 8 p.m. before the current was restored. The second failure was at 8.45 p.m., and lasted about half-an-hour.



DEMPSTER'S PLANT FOR LIGHTLY CARBURETTED WATER GAS.

DEMPSTER'S
COMBINATION OF
BLUE AND
CARBURETTED
WATER GAS
PLANTS

THE BEST FOR
EFFICIENT
AND ECONOMIC
RESULTS.

R. & J. DEMPSTER, LD.,
GAS PLANT WORKS,
MANCHESTER.

Telephones: 54 and 2296 Central.
LONDON TELEPHONE: VICTORIA 7426.

Nottingham Gas Supply.—Much has been heard recently in Nottingham and the outside districts which are covered by the Corporation service, as to the indifferent quality of the gas supply. There have also been fears raised that the Gas Committee might be driven, at an early date, further to increase charges which have been already substantially added to, but upon this point misgivings were dispelled, at a recent municipal election meeting, by Mr. F. Jackson, a member of the Committee, who declared that at the earliest possible moment they would not only decrease the price, but improve the illuminating power of the gas. Mr. Jackson also served a useful purpose in directing attention to the many crippling processes to which the undertaking, in common with others throughout the country, was subjected during the war, and from which complete recovery has not yet been attained. Considering the enormous difficulties regarding coal supply, the Nottingham works were maintained during the war period at an efficiency which compared favourably with most others.

Aberdovey Gas-Works Ownership.—The gas supply at Aberdovey was the subject of considerable discussion at a meeting of the Towyn and Aberdovey Urban Council last week. The report of the Aberdovey Committee contained an intimation that the Committee thought it desirable that the Council should acquire the gas-works at Towyn, and asked the co-operation in the matter of the Towyn Committee with Aberdovey. Mr. Rowlands said the Council should do something in this connection. The gas supplied was very unsatisfactory; and he was strongly of opinion that the works should be the property of the ratepayers. As directed by the Clerk, he understood it must be one purchase; but this could be made a matter of arrangement between the two places. Mr. Llewellyn Lewis said the Company could not go on without spending thousands of pounds; and the Council, after buying, would also have to spend largely on re-modelling the works. It was decided to refer the matter to the two Committees to hold a joint meeting and report.

STOCK MARKET REPORT.

BUSINESS on the Stock Exchange last week continued very unsatisfactory—all the old depressing factors in affairs at home and abroad still brooding over the markets; but the closing day seemed a fraction less dull.

The gilt-edged market was not exempt. Home Government securities were variable; only War Loan of the big four doing fairly well. Friday's figures were as follows: Consols 48⅜-49, War Loan 89⅜-90⅜, Funding 71⅜-72⅜, Victory 77-77½. Some bonds were in request; but the new Colonials were not supported.

Railways in general were lower—Home, Canadian, and Argentine. Weakness continued in the Foreign Market with scarcely an exception. The Miscellaneous Market in general was depressed; but Oil made a slight rally.

Business in the Gas Market "kept the noiseless tenor of its way," and the predominant tendency was very good. In the London Companies, a small reaction was experienced—Gas Light and South Metropolitan dropping ½; but the Suburban and Provincial group continued to make further advances. Both Brighton and Hove issues and Hornsey rose 5, Brentford "B" and Lea Bridge 2 each, South Shields 3, Newcastle debenture 1, British ½, and North Middlesex 7 p.ct. ¼. In the Continentals, Imperial was weaker, and the quotation fell 5; but the debenture was raised 1. Primitivas were quiet and unchanged.

Bargains done for cash during the week were as follows: On Monday, Alliance and Dublin 49⅜, 50⅜, Bombay 3, Brentford "B" 66½, Gas Light ordinary 58, 58⅛, 58¼, 58⅜, 59, Imperial Continental 138, 139, Primitiva preference 40s., South Metropolitan 68, 69, ditto debenture 50, ditto 6½ p.ct. debenture 101⅛, 101¼, Wandsworth debenture 45⅝, Sutton Consumers 43⅜, 44⅛. On Tuesday, Bombay 3⅛, 3 1/10, Brentford "B" 65, Gas Light ordinary 57⅜, 58, ditto preference 60, ditto debenture 51, Hong Kong and China 5¼, 5 5/16, Imperial Continental 137, ditto debenture 82, 82½, Lea Bridge 72, 72⅛, North Middlesex 7 p.ct. 8, 8¼, Oriental 8⅜, Primitiva 14s. 6d., 14s. 7d., ditto preference 39s. 3d., 39s. 9d., 40s., South Metropolitan 67½, 68, 68⅜, ditto 6½ p.ct. debenture 100⅜-101⅛, South Suburban debenture 74, ditto 7 p.ct. debenture 100⅜. On Wednesday, Brentford "B" 66¼, Continental Union 18, ditto preference 30½, Gas Light ordinary 57, 57¼, 57½, 58, Imperial Continental 133, 135, South Metropolitan 67½, 68, ditto 6½ p.ct. debenture 101¼, Wandsworth New 57½, Uxbridge 5 p.ct. 51, 51½. On Thursday, Alliance and Dublin 49⅜, 49⅝, 50, 50⅜, Bombay £3 os. 6d., 3⅛, Continental Union preference 30½, 30⅜, 31, Gas Light ordinary 57, 57¾, ditto maximum 44⅛, Imperial Continental 133, 134, 134 7/16, 135, 135⅛, Lea Bridge 72⅛, Malta and Mediterranean 2, 2⅛, Primitiva preference 38s. 6d., 40s., South Metropolitan 68, ditto 6½ p.ct. debenture 100⅜-101⅛, Wimbledon 53½, 54, 54⅛, Hong Kong and China 5 p.ct. debenture 59⅛, 60, Colombo 7 p.ct. preference 7 3/16, 7¼. On Friday, Bombay £3 os. 6d., 3⅛, Brentford "A" 70, Continental Union preference 31, Gas Light ordinary 57, 57⅛, 57⅜, ditto maximum 44⅜, Imperial Continental 133, 134½, 135, 135½, 136, 137, Lea Bridge 72⅛, Malta and Mediterranean 2, Primitiva 14s. 6d., San Paulo preference 6⅛, South Metropolitan preference 94½, ditto 6½ p.ct. debenture 101¼, Croydon 7 p.ct. debenture 101, 101¼.

In the Money Market, the superabundance of supplies was such that a vast amount of money remained "unemployed;" and discount rates at an almost impossibly low figure were not refused. Silver was pressed for sale, and touched 39⅛d., but made a partial recovery to 40⅛d. before the close. The Bank rate is 5½ p.ct., as fixed on July 12.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
182,049	Stk.	Aug. 26	4	4%	Aldershot 4 p.c. Pref. .	...	50—55	...
1,551,868	,,	Oct. 13	2½	3 1/16%	Alliance & Dublin Ord.	59—64	48—51*	49⅛—50⅜
374,000	,,	July 14	4	4%	Do. 4 p.c. Deb.	76—79	46—51	...
280,000	5	Aug. 11	7½	4/-	Bombay, Ltd. . . .	5½—6½	3—3⅛	3—3⅛
100,000	5	,,	16	4/7½	Bournemouth Gas and Water { 3 p.c. . . B 7 p.c. . Pref. 6 p.c. 4 p.c. Deb.	...	7⅜—8⅛	...
383,110	10	,,	7	7/-		13—15½	8½—9⅜	...
115,000	10	,,	6	6/-		13½—14	7⅜—8⅛	...
162,065	—	June 30	—	4%		...	54—59	...
992,045	Stk.	July 15	14	56/-	Brentford A Consolid. .	261—266	68—71	70
734,920	,,	,,	11	55/-	Do. B New . .	204—209	64—67	65—66½
55,000	,,	,,	5	5%	Do. 5 p.c. Pref. .	109—111	68—72	...
221,400	,,	June 15	4	4%	Do. 4 p.c. Deb. .	91—93	57—59	...
214,775	,,	Aug. 26	11	10½%	Brighton & Hove Orig. .	208—213	115—120	...
244,200	,,	,,	8	7½%	Do. A Ord. Stk.	154—159	82—87	...
1,287,500	Stk.	July 28	5	5%	Bristol 5 p.c. max. . .	...	...	...
530,000	20	Sept. 29	12½	10%	British	44—45	21—24	...
120,000	Stk.	June 30	4	4%	Do. 4 p.c. Deb. Stk.	88—90	55—58	...
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	42—45	...
100,000	10	May 27	—	6%	Cape Town & Dis., Ltd.	1½—2½	6½—7½	...
100,000	10	Apl. 28	—	4½%	Do. 4½ p.c. Pref. .	4—6	4⅜—5⅜	...
100,000	Stk.	June 30	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	53—58	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord. . .	108—110	...	...
1,513,280	,,	July 28	5/9/4	42/8	Commercial 4 p.c. Stk.	106—108	54—57	...
360,000	,,	,,	5⅛	38/4	Do. 3½ p.c. do.	103—105	52—55	...
475,000	,,	June 15	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	44—47	...
800,000	,,	Dec. 11	4	—	Continental Union Ltd.	76—79	18—20	18
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	113—118	30—35	30½—31
51,600	,,	Aug. 26	15	15%	Croydon A 10 p.c. . .	...	150—155	...
278,400	—	,,	12	12%	Croydon B and C 7 p.c.	..	120—125	...
492,270	Stk.	—	6	4½%	Derby Con. Stk. . . .	125—125	...	...
55,000	,,	—	4	4%	Do. Deb. Stk. .	103—104	...	...
1,002,180	10	Jan. 29	10	5/0	European, Ltd. . . .	17½—18	6½—7½	...
16,398,975	Stk.	Aug. 11	1/17/4	46/8	Gas Light and Coke { 4 p.c. Ord. . . 3½ p.c. max. . 4 p.c. Con. Pref. 3 p.c. Con. Deb. 10 p.c. Bonds. .	98—102	57—60	57—59
2,600,000	,,	,,	3½	35/-		76—79	44—46	44⅛—44⅜
4,062,235	,,	,,	4	4%		96—99	58—60	60
4,674,850	,,	June 15	3	3%		72½—74½	50—52	51
130,000	,,	Dec. 11	10	10%		...	...	...
82,500	,,	Sept. 14	5	3⅛%	Hastings & St. L. 5 p.c.	...	48—50	...
258,740	,,	,,	3½	2⅞%	Do. 3½ p.c.	87—89	34—36	...
70,000	10	May 12	11	5%	Hongkong & China, Ltd.	16½—16½	5—6	5½—5 5/16
86,600	Stk.	Aug. 26	9	9½%	Hornsey 7 p.c. . . .	...	100—105	...
131,000	,,	July 28	7½	7½%	Ilford A and C . . .	151—154	80—82	...
65,780	,,	,,	6½	5⅞%	Do. B	113—118	57—59	...
63,500	,,	June 30	4	4%	Do. 4 p.c. Deb. . .	92—94	54—56	...
1,976,000	,,	May 27	9	5%	Imperial Continental .	150—160	133—138	133—139
1,235,000	,,	Aug. 11	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	81—83	82—82½
255,242	,,	Mar. 30	6½	3½%	Lea Bridge Ord. 5 p.c. .	119—121	71—73	72—72½
2,498,905	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord. { A. B.	211—215	...	...
						146—148	...	...
306,085	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	...	...	...
165,736	,,	Aug. 11	7/5/6	6%	Maidstone 5 p.c. . .	...	54—56	...
63,480	,,	Dec. 30	—	3%	Do. 3 p.c. Deb. . .	...	40—43	...
75,000	5	June 11	6	3%	Malta & Mediterranean	4½—4¾	1½—2½	2—2⅛
250,000	100	Oct. 3	4½	4½%	Met. of Melbourne { 4½ p.c. Deb.	99—101	88—96	...
541,920	Stk.	May 27	4	6%	Monte Video, Ltd. . .	11½—12	55—60	...
1,875,892	,,	July 28	4½	5%	Newcastle & Gatsh'd Con.	98½—99½	58—60	...
529,705	,,	June 30	3½	3½%	Do. 3½ p.c. Deb.	82—85	50—51	...
15,000	10	Aug. 26	—	7/6	North Middlesex 10 p.c.	...	12⅜—13½	..
55,940	10	,,	7/14/0	5/3	,, ,, 7 p.c.	14—15	7⅛—8½	8—8½
300,000	Stk.	May 12	8	8%	Oriental, Ltd. . . .	117—122	88—93	89½
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd. . . .	7½—7¾	2—3	...
188,120	Stk.	June 30	—	3⅛%	Plym'th & Stoneh'se 5 p.c.	...	64—67	...
60,000	50	Aug. 26	15	60/-	Portsea Island, B . .	128—131	64—67	...
100,000	50	,,	12	55/-	Do. C . .	118—121	51—54	...
249,980	5	April 29	8	—	Primitiva Ord. . . .	5½—6	2½—3½	14/6—14/9
499,960	5	June 26	5	—	Do. 5 p.c. Pref. .	4½—5	1⅛—2⅛	38/6—40/-
321,600	100	June 1	4	4%	Do. 4 p.c. Deb. .	91—93	65—67	...
600,000	Stk.	July 28	4	4%	Do. ,, ,, 1911	...	42—45	...
346,198	,,	June 30	4	4%	River Plate 4 p.c. Deb.	85—87	42—45	...
150,000	10	Sept. 29	6	6/-	San Paulo { 6 p.c. Pref. 5 p.c. Deb.	10½—11	6—6½	6½
125,000	50	June 30	5	5%		47—49	35—38	...
135,000	Stk.	Aug. 26	10	5%	Sheffield A	223—224	61—62	...
209,984	,,	,,	10	5%	Do. B	222—224	60—62	...
523,500	,,	,,	10	4½%	Do. C	220—222	59—61	...
133,201	Stk.	Sept. 15	4	4%	Shrewsbury 5 p.c. . .	...	...	...
90,000	10	June 30	9	8%	South African	10½—11½	7—9	...
6,609,895	Stk.	July 28	5/4/0	5%	South Met. Ord. . . .	111—113	67—70	67½—69
250,000	,,	July 14	—	5%	Do. Red. Pref. .	...	93—95	94⅛
1,895,445	,,	,,	5	5%	Do. 5 p.c. Deb. .	72½—74½	48—50	50
224,820	,,	Feb. 25	8½	7½%	South Shields Con. Stk.	157—159	88—90	...
1,087,795	,,	Aug. 11	6	5½%	S'th Suburb'n Ord. 5 p.c.	114—116	68—70	...
368,837	,,	June 30	5	5%	Do. 5 p.c. Deb. Stk.	116—118	73—76	74
647,740	,,	May 12	7½	3½%	Southampton Ord. . .	99—102	55—58	...
121,275	,,	June 30	4	4%	Do. 4 p.c. Deb. Stk.	...	59—61	...
120,000	,,	Aug. 11	—	6%	Tottenham District { A 5 p.c. . B 3½ p.c. . 4 p.c. Deb.	135—138	63—65	...
782,275	,,	,,	6	4½%		115—117	53—55	...
181,255	,,	June 15	4	4%		87—89	54—57	...
182,380	10	Dec. 30	3	—	Tuscan, Ltd.	5—6	1—2	...
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	45—50	...
256,476	Stk.	Aug. 26	5	5⅛%	Tynemouth 5 p.c. max.	108½—109	66½—68½	...
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Aug. 11	8½	66/3	Wandsworth A 5 p.c.	151—156	78—80	...
255,636	,,	,,	6½	51/3	Do. B 3½ p.c.	129—134	59—61	...
108,075	,,	,,	—	46/4½	Do. C . . .	...	55—57	...
140,865	,,	,,	—	46/4½	New Ordinary	...	57—59	57½
352,000	,,	,,	6½	45/-	Wimbledon 5 p.c. . .	117—122	53—55	53½—54½
98,000	,,	,,	6½	50/-	Epsom 5 p.c. . . .	121—126	56—58	...
88,416	,,	June 30	3	3%	3 p.c. Deb. Stk. . .	65—69	30—31	43½

* Ex Div.

Halifax Street Lighting.—The Halifax Corporation Watch Committee and Finance Committee are up-against each other on the question of street lighting. The Watch Committee urge the lighting of every lamp in the town until midnight from November 1 to December 1, and after this all-night lighting of all lamps. The Finance Committee, finding this will cost £2040 above the year's lighting estimates, oppose the recommendation. At present one lamp in three, and a few extra lamps at dangerous points, are lighted; and proposals for more lamps were opposed at the last Council meeting on the ground of cost.

A verdict of "Suicide," with the addition that there was not sufficient evidence to show the deceased's state of mind at the time, was returned at a Bradford inquest last Thursday, on Walter Fallon (59), who was found dead in bed, completely covered with bedclothes, the gas turned on, and a tube from the bracket to a plumber's blow-lamp near his head. He had been depressed since losing his work. At Huddersfield, a verdict of "Suicide by coal-gas poisoning" was returned in the case of John Rothery (59), who fixed a pipe to the gas-bracket, turned the gas on, and poisoned himself at the other end of the tube. He also had been depressed owing to unemployment.

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